FSIS Compliance Guideline for Minimizing the Risk of Shiga Toxin-Producing *Escherichia* Coli (STEC) and *Salmonella* in Beef (including Veal) Slaughter Operations 2017

The purpose of this guide is to help establishments that slaughter beef (including veal) to:

- **Implement effective sanitary dressing procedures designed to prevent carcass contamination.**
- **Implement effective decontamination and antimicrobial interventions.**
- **Properly assess microbial testing results, including results for indicators of process control, at any point during slaughter.**
- **Use the results from the implementation of these components of the food safety systems to assess the effectiveness of the overall HACCP system.**

Preface

What is the purpose of this Compliance Guideline?

The purpose of this compliance guideline is to provide beef (including veal) slaughter establishments information concerning best practices at slaughter that may be used to prevent, eliminate, or reduce levels of fecal and associated microbiological contamination, specifically STEC and *Salmonella* contamination in beef (including veal). For the purpose of this document, when the document references beef, veal is also included. This Compliance Guideline follows the procedures for guidance documents in the Office of Management and Budget's (OMB) *"Final Bulletin for Agency Good Guidance Practices (GGP)"*. More information can be found on the Food Safety and Inspection Service (FSIS) Web page.

This document provides guidance to assist establishments in meeting FSIS regulations. Guidance represents best practice recommendations by FSIS, based on the best scientific and practical considerations, and does not represent requirements that must be met. Establishments may choose to adopt different procedures than those outlined in the guideline to prevent contamination, but they would need to support why those procedures are effective. Please note that this Guideline represents FSIS's current thinking on this topic and should be considered usable as of the issuance date.

This guideline is focused on small and very small establishments in support of the Small Business Administration's initiative to provide small and very small establishments with compliance assistance under the Small Business Regulatory Flexibility Act (SBRFA). However, all FSIS regulated beef slaughter establishments may be able to apply the recommendations in this guideline. It is important that small and very small establishments have access to a full range of scientific and technical support, and the assistance needed to establish safe and effective HACCP systems. Although large establishments can benefit from the guidance that FSIS provides, focusing the guidance on the needs of small and very small establishments provides them with information that may be otherwise unavailable to them.

Who is this guideline designed for?

FSIS designed this guideline for beef (including veal) slaughter establishments. The best practices discussed in this guideline may also be useful to establishments that slaughter bison.

Key Point

This guidance provides information concerning best practices at slaughter that may be used to prevent, eliminate, or reduce levels of *Salmonella* and STEC in beef (including veal).

How can I comment on this guideline?

FSIS is seeking comments on this guideline as part of its efforts to continuously assess and improve the effectiveness of policy documents. All interested persons may submit comments regarding any aspect of this document, including but not limited to: content, readability, applicability, and accessibility. The comment period will be 60 days from March 3, 2017 and the document will be updated in response to the comments.

Comments may be submitted by either of the following methods:

Federal eRulemaking Portal Online submission at regulations.gov: This Web site provides the ability to type short comments directly into the comment field on this Web page or attach a file for lengthier comments. Go to http://www.regulations.gov and follow the online instructions at that site for submitting comments. Mail, including - CD-ROMs, and hand- or courier-delivered items: Send to Docket Clerk, U.S. Department of Agriculture (USDA), FSIS, Patriots Plaza 3, 1400 Independence Avenue SW, Mailstop 3782, 8-163A, Washington, DC 20250-3700.

All items submitted by mail or electronic mail must include the Agency name, FSIS, and document title: FSIS Compliance Guideline for Minimizing the Risk of Shiga Toxin-Producing *Escherichia coli* (STEC) and *Salmonella* in Beef (including Veal) Slaughter Operations 2016.

Comments received will be made available for public inspection and posted without change, including any personal information, to http://www.regulations.gov.

Is this version of the guideline final?

No, FSIS will update this guideline in response to comments.

What if I still have questions after I read this guideline?

FSIS recommends that users search the publicly posted Questions & Answers (Q&As) in the *askFSIS* database or submit questions through *askFSIS*. Documenting these questions helps FSIS improve and refine present and future versions of the Compliance Guideline and associated issuances.

When submitting a question, use the Submit a Question tab, and enter the following information in the fields provided:

Subject Field:	Enter **FSIS Compliance Guideline for Minimizing the Risk of Shiga Toxin-Producing *Escherichia coli* (STEC) and *Salmonella* in Beef (including Veal) Slaughter Operations 2016**
Question Field:	Enter question with as much detail as possible.
Product Field:	Select **General Inspection Policy** from the drop-down menu.
Category Field:	Select **Sampling** from the drop-down menu.
Policy Arena:	Select **Domestic (U.S.) only** from the drop-down menu.

When all fields are complete, press **Continue**.

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FSIS Compliance Guideline for Minimizing the Risk of Shiga Toxin-Producing *Escherichia coli* (STEC) and *Salmonella* in Beef (including Veal) Slaughter Operations

Why was this guideline developed?

Since issuing the first version of this guidance in September 2002, FSIS has made significant changes to policies and testing procedures affecting beef slaughter establishments. This guideline has been updated to help beef slaughter establishments comply with the changes. Some of the significant policy changes include:

- In October 2002, FSIS issued a Federal Register notice that required all establishments producing raw beef products to reassess their HACCP plans in light of new FSIS testing methods and higher prevalence estimates.
- In September 2011, FSIS declared six non-O157 STECs (O26, O45, O103, O111, O121, and O145) adulterants in raw, non-intact beef products and product components.
- In November 2011, FSIS issued instructions to inspection personnel to verify that cattle slaughter operations are implementing sanitary dressing and process control procedures and that the procedures they are implementing prevent contamination of carcasses and ensure that insanitary conditions are not created. Those instructions are still in place.
- In June 2012, FSIS began testing for non-O157 STEC in addition to *E. coli* O157:H7 in beef manufacturing trimmings.
- In June 2014, FSIS began analyzing for *Salmonella* all raw beef samples it collects for STEC analysis. FSIS announced its intention to develop a new ground beef performance standard based on these data. FSIS also intends to use these data to develop compliance guidance for establishments that produce trim.
- In August 2014, FSIS began a beef-veal carcass baseline to test carcasses for the presence and levels of STEC, *Salmonella*, and certain indicator organisms during the beef slaughter process. FSIS intends to use the results from the study to develop compliance guidance for establishments that slaughter cattle to use in assessing their process control of sanitary dressing and slaughter controls.
- In August 2014, FSIS issued revised compliance guidance concerning the sampling of beef manufacturing trimmings for STEC. The guidance includes information concerning the development and implementation of statistical process control procedures that slaughter/fabrication establishments can use to assess the effectiveness of their controls for preventing contamination during the slaughter operation. The guidance also recommends criteria for high event periods (HEPs).
- In January 2015, FSIS issued instructions to inspection personnel on how to conduct traceback activities from the grinder or bench trim establishment and to verify that an establishment's action in response to an HEP is appropriate.

Cattle have been identified as an important reservoir for pathogens including Shiga toxin-producing *Escherichia coli* (STEC) and *Salmonella*, which are important causes of foodborne disease. The hides, hooves, and gastrointestinal (GI) tracts of cattle can contain these pathogens. Contamination can be transferred from the hide, hooves, and GI

tracts of cattle through poor sanitary dressing procedures. Effective sanitary dressing procedures underpin the interventions that an establishment has in place to prevent, eliminate, or reduce to an acceptable level food safety hazards that are reasonably likely to occur in the slaughter process.

FSIS recommends that slaughter operations focus on their sanitary dressing procedures in order to prevent carcass contamination and the creation of insanitary conditions. Poor sanitary dressing procedures result in carcass contamination (visible or invisible, e.g., microbial contamination) and limit the effectiveness of antimicrobial interventions.

FSIS developed this Guideline to assist establishments that slaughter beef (including veal) to prevent and minimize the risk of STEC and *Salmonella* in their operations. This guidance will

- help establishments design comprehensive written sanitary dressing programs that focus on preventing contamination throughout the slaughter process
- show establishments how to implement antimicrobial interventions effectively
- help establishments develop verification activities to ensure sanitary dressing procedures are consistently performed and effective

As described in the FSIS Compliance Guideline for Establishments Sampling Beef Trimmings for Shiga Toxin-Producing E*scherichia coli* (STEC) Organisms or Virulence Markers, establishment verification testing results on trimmings are likely the best available objective information a slaughter establishment can use to determine the ongoing effectiveness of its slaughter/dressing operation. Establishments that incorporate statistical process control procedures into their testing programs as described in the trim sampling guidance document in conjunction with the information in this guidance document will improve the design and implementation of their slaughter HACCP system.

Further, in the guidance discussed in the previous paragraph, FSIS recommends that slaughter establishments develop criteria for identifying high event periods (HEPs) or follow FSIS criteria for identifying HEPs. HEPs are periods in which slaughter establishments experience a high rate of positive results for STEC (or virulence markers) in trim samples from production lots containing the same source materials. That is, the trim was produced from one or more carcasses slaughtered and dressed consecutively or intermittently within a defined period of time (e.g., shift).

Key points

- Most food safety hazards inherent in raw processes originate with the live animals that enter the slaughter establishment.
- *Salmonella* and *STEC* are commonly found on the hides, hooves and in the GI tracts of cattle.
- Effective sanitary dressing procedures during slaughter can reduce microbial contamination.

A HEP may mean that a systemic breakdown of the slaughter dressing operation has occurred

and has created an insanitary condition applicable to all parts of the beef carcass (e.g., primal cuts in addition to the beef manufacturing trimmings and other raw ground beef and patty components). FSIS recommends that establishments identify HEP criteria so that they can determine whether they need to withhold product from commerce when a HEP has occurred. A HEP may indicate more widespread adulteration of product, beyond the product found positive. If establishments identify and respond to HEP, they will minimize the chance that they release adulterated product into commerce. More information on the development and implementation of statistical process control procedures, recommended criteria for identifying HEP, and guidance for responding to HEP are included in the FSIS Compliance Guideline for Establishments Sampling Beef Trimmings for Shiga Toxin-Producing *Escherichia coli* (STEC) Organisms or Virulence Markers.

What regulatory requirements are addressed by this guideline?

Regulation	Description
9 CFR 310.18(a)	Requires establishments to handle carcasses, organs and other parts in a manner to prevent contamination
9 CFR 416.1 through 416.5	Requires establishments to operate in a manner to prevent the creation of insanitary conditions and prevent adulteration.
9 CFR 417.2(a)(1)	Requires an establishment to conduct a hazard analysis to identify food safety hazards that might occur in the production process, assess which hazards are reasonably likely to occur, and develop measures to prevent, eliminate, or reduce the identified hazards to an acceptable level.
9 CFR 417.2(c)(3)	Requires the establishment to develop critical limits for critical control points (CCPs) to control hazards that are reasonably likely to occur.
9 CFR 417.4(a)(2)	Requires establishments to verify that the HACCP system is effectively implemented on an ongoing basis
9 CFR 417.5(a)(1)	Requires establishments to maintain supporting documentation associated with the hazard analysis
9 CFR 417.5(a)(2)	Requires establishments to maintain decision making documents associated with the selection and development of CCP's and critical limits, and documents supporting both the monitoring and verification procedures selected and the frequency of those procedures.

How do establishments use this document to develop a comprehensive, robust food safety system that incorporates these recommendations?

This document provides an overview of the slaughter process and includes the best practices at each step in the slaughter process to minimize contamination. As previously discussed, FSIS recommends that establishments develop written sanitary dressing procedures designed to prevent contamination from occurring throughout the slaughter process and develop verification activities to ensure the procedures are performed consistently and are effective. Establishments can use the information in Appendix 1, Establishment Self-Assessment Checklist, to develop written sanitary dressing procedures designed to prevent contamination throughout the slaughter process and design verification activities to ensure that their employees are performing the procedures on an on-going basis.

Establishments can use Appendix 2, Carcass Sanitary Dressing Audit, to verify, in real-time using carcass audits, that their sanitary dressing procedures are effectively preventing contamination throughout the slaughter process.

FSIS also recommends that establishments implement antimicrobial intervention treatments, as needed, to reduce contamination to acceptable levels. This document discusses intervention treatments, their role in a comprehensive food safety system, and how to design and implement them effectively.

Key Point

The goal of this guideline is to help establishments design and implement a robust food safety system. Establishments that use this guidance can reduce their likelihood of producing adulterated products.

FSIS recommends that establishments test trim for STEC to assess the effectiveness of their controls for preventing contamination during the slaughter operation. As is discussed above, FSIS has developed a guidance document for beef slaughter/fabrication establishments to develop and implement statistical process control procedures for STEC trim testing to assess the effectiveness of slaughter operations. The guidance document also includes recommended HEP criteria for identifying situations that indicate a systemic breakdown of the slaughter operation has occurred and has created an insanitary condition applicable to all parts of the beef carcass (e.g., primal cuts in addition to the beef manufacturing trimmings and other raw ground beef and patty components). FSIS recommends that establishments use the trim sampling guidance document in conjunction with the information in this guidance document to design and implement a robust food safety system to improve their process over time.

Overview of the Beef Slaughter Process

KEY DEFINITIONS:

Sanitary Dressing: The practice of handling carcasses by establishment employees and machinery in a manner that produces a safe and wholesome product in a sanitary environment.

Process Control Procedure: A defined procedure or set of procedures designed by an establishment to provide control of those operating conditions that are necessary for the production of safe, wholesome food. The procedures typically include some means of evaluating system performance using process control criteria, actions to take to ensure the system remains under control, and planned measures to take in response to a loss of process control. The procedures can be used as support for decisions made in the hazard analysis.

What are the food safety hazards of concern during slaughter and where do they come from?

FSIS considers raw non-intact beef products and raw intact beef source materials intended for use in such non-intact product that are contaminated with adulterant STEC (*E. coli* O157:H7, O26, O45, O103, O111, O121, and O145) to be adulterated.

The best practices concerning effective sanitary dressing procedures, antimicrobial intervention strategies, and appropriate use of microbial data in decision making outlined in this guidance document will assist establishments in reducing all of these pathogens.

Most of the food safety hazards inherent in raw processes originate with the live animals that enter the slaughter establishment. Common hazards include the ***biological*** hazards of bacterial pathogens, the ***chemical*** hazard of residues, and the ***physical*** hazards of foreign material. These hazards could be present in raw product in any step of the food process. Enteric organisms, such as *Escherichia coli* and *Salmonella* are commonly found as part of the normal bacteria of the intestinal tract of animals. Some strains, notably the Shiga toxin-producing *E. coil* (STEC) including *Escherichia coli* O157:H7, and certain *Salmonella* serotypes can cause serious foodborne illness in humans. Cattle may carry STEC and *Salmonella* in their intestinal tract and they may also be present on the hides of animals presented for slaughter.

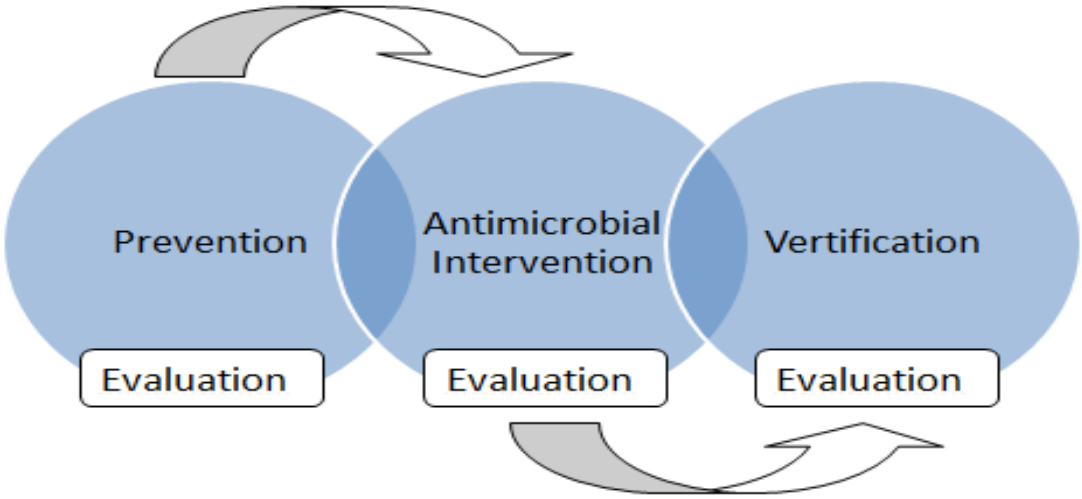
What are the guiding principles for minimizing the risk of STEC and *Salmonella*?

The four main guiding principles for minimizing the risk of contamination during the slaughter process are:

1) Prevention through effective sanitary dressing procedures,
2) use of Antimicrobial Interventions,

3) Establishment verification that the system is functioning as intended, and
4) Evaluation of slaughter procedures during all steps of the process.

These principles are interrelated and are vital components of an effective slaughter food safety system. A description of each principle follows.



PREVENTION	Slaughter operations should develop sanitary dressing procedures that prevent carcass contamination and the creation of insanitary conditions throughout the slaughter process. Effective and consistently performed sanitary dressing procedures that focus on preventing contamination directly impact whether interventions in place will effectively reduce pathogens.
ANTIMICROBIAL INTERVENTIONS	Establishments should implement decontamination and antimicrobial treatments as needed to reduce *Salmonella* and STEC to a non-detectable level. Establishments should identify supporting documentation that closely matches their interventions, identify the critical operational parameters that are necessary for the intervention to be effective, and implement their interventions so that they meet these parameters.
VERIFICATION	Establishments should develop verification activities that demonstrate that their slaughter process is effectively reducing hazards. This should generate real-time data of employees performing procedures as written to verify the procedures were effectively implemented (e.g., carcass audits after points in the slaughter process where carcasses are vulnerable to contamination). Establishments should develop microbiological testing procedure designed to detect contamination in product lots and microbiological test results to demonstrate the lots are free of contamination.

EVALUATION

Establishments should review the results concerning the implementation of their sanitary dressing procedures, antimicrobial interventions, and verification testing to assess what the results indicates about the overall effectiveness of their food safety system.

Best Practices for Sanitary Dressing & Process Control

What is the importance of sanitary dressing and process control procedures?

FSIS has found adulterant non-O157 STEC and *E. coli* O157:H7 in beef manufacturing trimmings. Additionally, FSIS has found *E. coli* O157:H7 in other raw ground beef components (including head meat and cheek meat), and raw ground beef. Further, ground beef contaminated with Salmonella has caused a number of foodborne disease outbreaks. The presence of these enteric pathogens in these products can be attributed, in part, to ineffective sanitary dressing and process control procedures that create insanitary conditions during slaughter. Insanitary practices during slaughter can introduce microbial and visible contamination (e.g., fecal material, ingest, and milk) to carcasses and parts.

Key points

- Effective sanitary dressing measures address multiple points in the slaughter process where carcasses are vulnerable to contamination.
- All controls in slaughter and dressing procedures should be aimed at preventing contamination.
- If sanitary dressing and process control procedures are not properly implemented, the HACCP system may be inadequate.

Effective sanitary dressing and process control procedures, coupled with effective decontamination and antimicrobial intervention treatments, are necessary to prevent the creation of insanitary conditions. Establishments that fail to control these procedures and treatments create the potential for the contamination of carcasses and parts in their food safety systems. Effective sanitary dressing and process control procedures underpin the critical control points (CCPs) that an establishment has in place to prevent, eliminate, or reduce to an acceptable level food safety hazard that are reasonably likely to occur in the slaughter process and that support the HACCP system is functioning as intended. If sanitary dressing and process control procedures are not properly implemented the HACCP system may be in adequate.

Insanitary practices can introduce a level of contamination that overwhelms the decontamination and antimicrobial intervention treatments to reduce STEC and *Salmonella* to acceptable levels. FSIS believes slaughter operations should more consistently focus on their sanitary dressing

and process control procedures in order to prevent carcass contamination and the creation of insanitary conditions in their operations.

Fundamental sanitary dressing practices to prevent carcass contamination and the creation of insanitary conditions include:

1. Maintaining adequate separation of carcasses, parts, and viscera during dressing in order to prevent cross contamination.

2. Cleaning and sanitizing or sterilizing equipment and hand tools routinely that are used to remove contamination or to make cuts into the carcass. Cleaning and sanitizing equipment between each dirty cut and between each carcass is most effective.

3. Designing and arranging equipment to prevent the contact of successive carcasses and parts with contaminated equipment, and not allowing the hide during its removal to flap or splatter which could cause contamination of the same or nearby carcasses.

4. Frequently washing hands and aprons that come in contact with the carcass and parts.

5. Implementing decontamination and antimicrobial intervention treatments such as washes or sprays on carcasses and parts in accordance with the limits selected by the establishment, and documented to be adequate to address contamination.

What verification activities related to sanitary dressing should establishments develop?

Establishments should observe employees to verify that employees are performing the sanitary dressing procedures as written. Establishments should verify that the procedures are effective by conducting carcass audits (periodic visual evaluation of the carcass throughout the dressing process, Appendix 2) and by sampling and testing beef manufacturing trimmings, other raw ground beef components (including head meat and cheek meat), and raw ground beef for microorganisms. Sampling for adulterant STEC (or virulence markers) in these products is an important verification activity that demonstrates whether the establishments HACCP system is effectively reducing STEC to below detectable levels and that hazard analysis decisions concerning STEC are supported on an ongoing basis. As explained in the *FSIS Compliance Guideline for Establishments Sampling Beef Trimmings for Shiga Toxin-producing Escherichia coli (STEC) Organisms or Virulence Markers*, establishment verification testing results on trimmings are likely the best available objective information a slaughter establishment can use to determine the ongoing effectiveness of its slaughter/dressing operation.

FSIS recommends that establishments incorporate this sampling and testing into their process control procedures concerning sanitary dressing because the results from such testing are a direct reflection of the effectiveness of the slaughter operation. The process control criteria should define criteria that establish when the process is in control (such as an occasional,

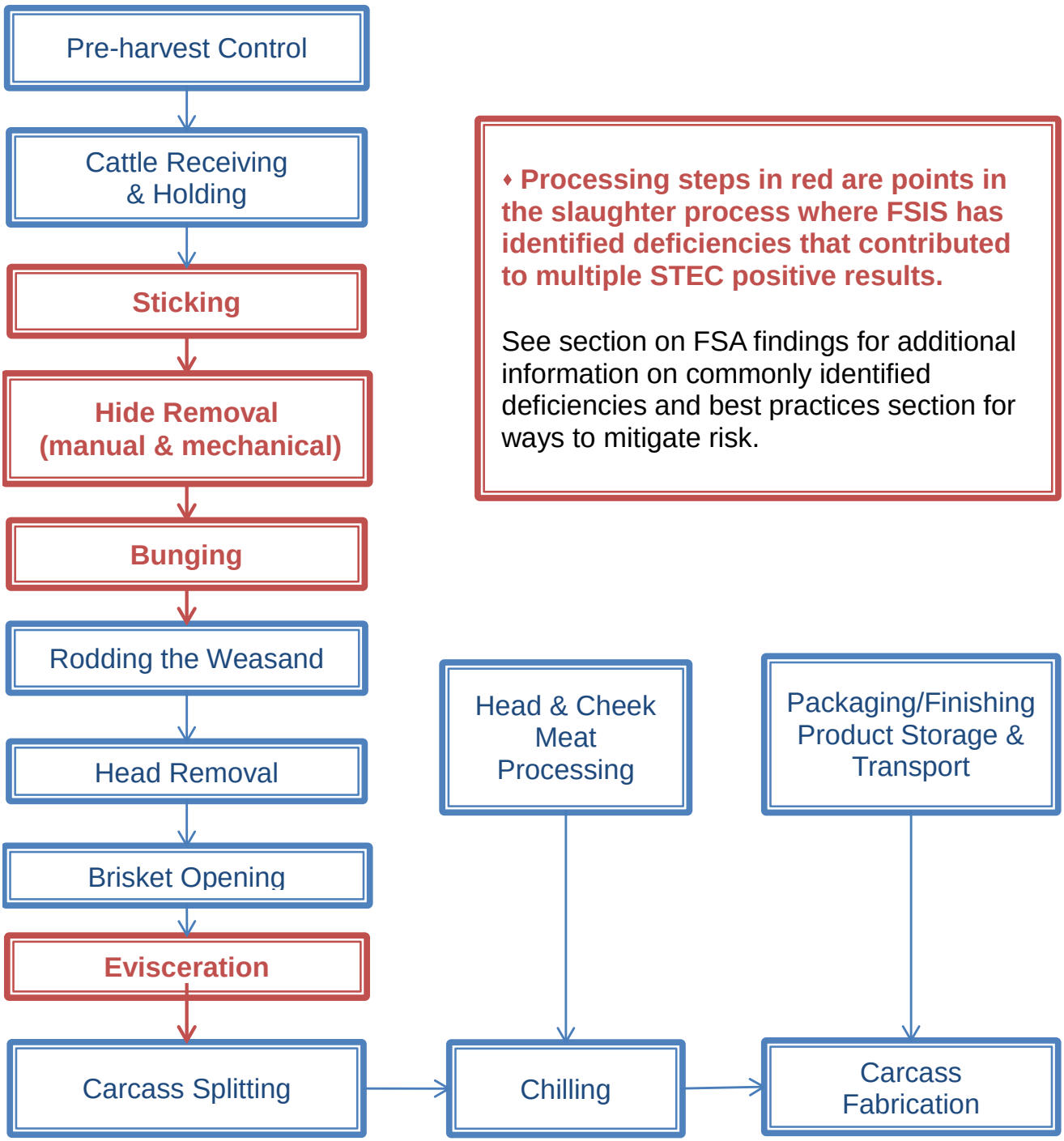
sporadic positive result) and when the establishment has lost process control as indicated by many positives over time. If past sample results lead establishment management to believe the process is out of control, the establishment should carefully investigate to find all contributing causes. This type of investigation would be more involved than a follow-up investigation when an occasional positive result is found. FSIS believes establishments should continually strive to eliminate STEC and decrease *Salmonella* percent positive over time by tightening their process control criteria as they gain more control over their slaughter operations. FSIS has found that microbiological testing results in safer programs when these results are used to inform the process and the process is adjusted in response to the test results.

FSIS inspection personnel, while performing the Beef Sanitary Dressing task, verify whether cattle slaughter operations are implementing sanitary dressing and process control procedures, and that the procedures they are implementing prevent contamination of carcasses and ensure that insanitary conditions are not created (see FSIS Directive 6410.1, *Verifying Sanitary Dressing and Process Control Procedures by Off-line Inspection Personnel (IPP) in Slaughter Operations of Cattle of Any Age*).

FSIS inspection personnel also verify, through microbial sampling, HACCP verification tasks and Hazard Analysis Verification (HAV) tasks whether establishments adequately address STEC (see FSIS Directive 10,010.1, *Sampling Verification Activities for Shiga Toxin-Producing Escherichia coli (STEC) in Raw Beef products*, and FSIS Directive 10,010.2, *Verification Activities for Shiga Toxin-Producing Escherichia coli (STEC) in Raw Beef Products*).

Enforcement, Investigations and Analysis Officers (EIAO) assess and analyze an establishment's food safety system to verify that the establishment is able to produce safe and wholesome meat products (see FSIS Directive 5100.1, *Enforcement, Investigations and Analysis Officer (EIAO) Food Safety Assessment Methodology*).

Best Practices for Each Beef Slaughter Processing Step



What are some pre-harvest considerations and best practices?

FSIS encourages pre-harvest interventions as the first control steps in an integrated beef products safety system and has developed a guidance document on pre-harvest management controls for reducing STEC shedding in cattle. Pre-harvest interventions, adequate sanitary dressing procedures at slaughter, and adequate sanitary conditions during further processing are a part of an integrated approach to reduce the public health impact of STEC.

Below are additional recommendations not covered in the Pre-harvest guidance document referenced above.

What are mud scores and how can establishments use them to improve their food safety system?

Mud scores are classifications concerning the overall cleanliness of lots of cattle at receiving. For example, establishments can classify cattle into four groups:

1) Cattle that are less than 25% covered by dirt or mud;
2) Cattle that are greater than 25% and less than 50% covered by dirt or mud;
3) Cattle that are greater than 50% and less than 75% covered by dirt or mud; and
4) Cattle that are greater than 75% covered by mud.

After classifying cattle at receiving into one of these groups, establishments can develop specific measures they will take based on the lot of the cattle's classification. For example, if the cattle are in the third and fourth group, the establishment may decide to slow the line speed to give its employees more time to effectively dress the cattle that have higher gross contamination. The establishments may also add more trimmers or interventions, such as a hide-on carcass wash. In any case, it is important for the establishment to use the information it gathers at cattle receiving and develop measures to react to the information that is collected. As with other types of indicator testing, other factors should be considered when using mud scores to modify production processes. For instance, during certain times of the year, cattle may have higher mud scores than other times of the year (e.g., winter months versus summer months) when seasonal animal handling practices may influence the mud score. Therefore, different scoring criteria and trend analysis that varies by season may be needed to identify outliers.

What are best practices during cattle transport, receiving, and holding?

This is the point where cattle arrive at the establishment and are held before slaughter. There is an increased potential for contamination with enteric pathogens such as adulterant STEC and *Salmonella* during this time because of their presence on the hide and in feces of cattle. Additionally, transportation to the slaughter facility, handling during transport and unloading, and interaction with other cattle may cause stress and increased shedding of pathogens

Best Practices during Cattle Transport, Receiving and Holding

- Identify and obtain cattle from farms or feedlots that employ one or more production system or feedlot controls shown to reduce the carriage of STEC and *Salmonella*. Effective farm and feedlot management and control can reduce fecal shedding of the organism, as well as reduce the microbial load on the animals, and in the intestinal tract.
- Clean the unloading areas and pens periodically to reduce the contamination of animals.
- Wash cattle.
- Apply a water mist in the holding pens to reduce dust and dirt particles.
- Use a mud scoring system (i.e., a system to quantify the amount of mud on live animals) in order to identify cattle that may present an increased likelihood of contamination during hide removal.
- Apply an approved bacteriophage treatment to incoming cattle and allowing the bacteriophage appropriate contact time (A list of approved bacteriophages can be found in FSIS Directive 7120.1).
- Determine the incoming bacterial load on animals through microbiological sampling and testing of incoming cattle hides.
- Determine whether the age, type of cattle received (e.g. veal calves), or season (i.e., high prevalence season) represent a concern related to pathogen load and whether adjustments to the food safety system need to be made.
- When water is reused in non-food processing areas, the establishment should address potential biological, physical and chemical hazards associated in order to prevent the creation of insanitary conditions that could be associated with the water reuse.

What are the best practices during sticking?

This is the point in the process where the animal is bled. Regardless of the slaughter method, it is important for the establishment to minimize contamination of the carcass during any cut conducted at this step.

Best Practices during Sticking

- Keep the “dry landing” area where the stunned animals exit from the knocking box clean and dry of all blood, feces, ingesta, and mud between each animal.
- Use one knife to cut through the hide, and another knife (or the same knife sanitized) to cut the artery.
- Use a dual knife system (i.e., one knife is being used while one knife is being sanitized) and the hand is cleaned between sticking each carcass.
- Use the smallest cut possible to accomplish bleeding.
- Ensure blood collection devices and blood containers for edible blood are clean. Rinse and clean the collection funnel and knife after each carcass and sanitize after each identifiable lot of blood is drawn. Do not save blood from condemned animals.

What are best practices during hide removal?

This is the point in the process where the hide is removed from the animal. Hides are a significant source of contamination, and hide removal represents the greatest opportunity for carcass contamination. Contamination may be visible (e.g., dust, dirt, feces, mud) or invisible (i.e., microbiological). Establishments should take appropriate measures to prevent contamination during the dehiding process.

Hides are a significant source of contamination, and hide removal represents the greatest opportunity for carcass contamination. This is clearly illustrated in Nouet al. 2004 Journal of Food Protection 66:2005-9. This study sampled two groups of cattle at lairage and after dehiding. One group underwent a typical dehiding procedure. Sampling of these carcasses immediately after dehiding showed that 50% were positive for *E. coli* O157:H7. The other group of cattle was subjected a chemical dehairing process prior to hide removal. Carcasses in this group showed only a 1% positive rate for *E. coli* O157:H7 as well as a significantly lower level of other indicator organisms. This study demonstrates that transfer of contamination from the hair is a major contributor to the microbiological load onto carcasses.

Best Practices during Hide Removal

- Apply a validated hide-on intervention prior to hide removal. If cattle hides are wet after the antimicrobial treatment, remove excess moisture because run-off can contaminate exposed tissue during hide opening. Sanitized squeegees can be used to remove excess moisture to reduce the occurrence that this will occur.
- Mud balls can also represent a source of contamination. Establishments can use whizzard knives with dull blades or curry combs to remove the balls and other dirt off the hide prior to hide opening.
- Remove the front and hind feet before making any other incisions through the hide. Minimize the amount of foreshank tissue exposed.
- Ensure the skinning bed (for bed operations) is clean before lowering the carcass.
- Prevent the neck and shoulders from contacting the floor when lowering the carcass into the skinning bed. If this is not possible, install a sanitizable surface on the floor where the neck and shoulders contact.
- Prevent fecal matter that is expressed as the carcass is laid on the bed from contacting exposed carcass.
- Direct the knife toward the hair side of the skin when opening the hide to prevent contaminating the carcass.
- Remove visible contamination at the cut line (e.g., with air knives or by steam vacuuming).
- Steam vacuum or apply another validated antimicrobial treatment to pattern lines (i.e., cut lines where the hide is opened) even if visible contamination is not present
- Remove visible fecal contamination as soon as possible after it occurs to prevent microbial attachment.
- Use a dual knife system or, if not possible, dip the knife in the sterilizer after each incision through the hide.
- Space carcasses sufficiently apart to prevent contamination of skinned parts with adjacent carcasses.
- Design facilities to provide sufficient spacing between carcasses and walls, platforms, and other fixed object

Best Practices during Hide Removal Continued

- Remove lactating udders in a manner to prevent carcass contamination with udder contact
- Trim any contamination from udder content immediately.
- Reflect the hide away and preferably downward from the carcass as skinning proceeds. Skin each area back far enough to permit the hide to stay in a rolled-back position before the skinner proceeds to another skinning location.
- Use hide clips, as needed, to prevent hides from flapping and contacting exposed carcass. Clean and sanitize hide clips to prevent the creation of insanitary conditions.
- Prevent contamination to the tail or carcass while skinning the tail. Frequently clean hands and equipment at this step because the tail and switch are highly contaminated with urine and manure. This is particularly important when the same employee performs other tasks involving carcass contact.
- Clean and sterilize the clamp used to suspend the tail from the overhead spreader between each use or remove and discard the tip of the tail ahead of the clamped portion.
- Remove tail switches and bag the tails before using the tail puller.
- Inject air into skulls to facilitate hide removal from the head while using the hide puller.
- Ensure that mechanical hide pullers, side pullers, and tail pullers are properly adjusted. If they are not appropriately adjusted (e.g., pulling too fast, hard, or contacting exposed carcass), they can lead to carcass contamination and splatter.
- Monitor pullers on an on-going basis for proper adjustment.
- When using mechanical hide pullers, the tremendous energy exerted during the final removal of the hide can generate aerosols. Best practices in preventing cross contamination during this process are to:
    - Establish a maintenance program for the mechanical pullers.
    - Monitor pullers on an on-going basis for proper adjustment.
    - Install shields or devote an employee to hold up a shield.
    - Direct air flow away from the carcasses being skinned to prevent contamination of carcasses with the aerosols created at this step in the slaughter process.
- A simple way to evaluate if the hide, side, or tail puller is causing contamination is for an establishment employee to hold up a white piece of cardboard between the hide puller and the carcass during dehiding as well as adjacent carcasses (to the side of and behind, if the line wraps around). If the piece of cardboard becomes dirty, the unit is likely causing cross contamination and needs to be adjusted (i.e., the wheel spin needs to slow down) or the establishment should use shields.

Best Practices during Hide Removal Continued

- Apply paper towels to the carcass tissue adjacent to the hide to protect exposed carcass surface in the event the hide turns over when using the hide puller. In this case, if the hide turns over, the hide will touch the paper towel rather than the exposed carcass tissue.
- Maintain clean mechanical hide puller contact points with the hide, hands, and garments of the employees handling the hide and the carcass, and knives and other equipment contacting the de-hided carcass.
- Apply antimicrobial treatments (e.g., organic acids) immediately after the mechanical pullers.
- Locate a hide chute where hides are removed from carcasses. Do not spread hides on the slaughter floor.
- Use any type of chlorophyll detection equipment, at this point or later in the dressing process, as a means to identify fecal materials on carcasses, so employees can promptly remove the contamination.
- Maintain proper employee hygiene practices to prevent carcass contamination and the creation of insanitary conditions. Do not touch the carcass with soiled hands, tools, or garments.

What are best practices during bunging?

This is the point in the slaughter process where a cut is made around the rectum (i.e., terminal portion of the large intestine) to free it from the carcass, and then it is tied off and bagged to prevent spillage of fecal material. If the bung is not tied and bagged properly, the bung can contaminate the carcass.

When bunging is performed before the hide of the rump is removed, the outside of the bag can become contaminated from the hide. Then, when the gastrointestinal tract is removed during evisceration and the bagged bung is pulled through the pelvic inlet, the contamination on the outside of the bag can cause carcass contamination and the creation of insanitary conditions.

Best Practices during Bunging

- Drop the bung during the final part of rumping.
- Bag and tie off bungs to prevent carcass contamination.
- Use air inflation in the anus/vulvar area to facilitate bunging.
- Maintain proper employee hygiene practices to prevent carcass contamination and the creation of insanitary conditions. Do not touch the carcass with soiled hands, tools, or garments.
- Apply a validated decontamination or antimicrobial treatment at this point in the process that is effective in reducing the presence or counts of microbial contaminants.

What are best practices during weasand rodding?

This is the point in the process where the establishment uses a metal rod to free the esophagus (weasand) from the trachea and surrounding tissues. Weasand meat may be salvaged from the remainder of the gastrointestinal tract for use in raw ground beef production. Typically, the weasand is closed (i.e., tied) to prevent rumen spillage. If the weasand is not closed, ingesta and ruminal content can result in carcass contamination. It is important, at this point in the process, that contamination is not transferred from the exterior of the carcass to the interior or onto the weasand. In addition, if, during the rodding process, the gastro-intestinal tract is punctured, it can cause contamination of the carcass interior and exterior with ingesta content.

Best Practices during Weasand Rodding

- Close the esophagus to prevent leakage of rumen contents.
- Change or sanitize the weasand rod between each carcass.
- Maintain proper employee hygiene practices to prevent carcass contamination and the creation of insanitary conditions. Do not touch the carcass with soiled hands, tools, or garments.
- Clean and chill the weasand quickly to limit contamination and pathogen multiplication.
- Apply a validated decontamination or antimicrobial treatment at this point in the process that is effective in reducing the presence or counts of microbial contaminants.

What are best practices during head removal?

This is the point in the slaughter process where the head is removed from the carcass. It is important to maintain sanitary conditions because cross contamination can occur if the head comes into contact with insanitary heads, equipment, and employee hands or garments.

Best Practices during Head Removal

- Maintain adequate separation between skinned heads, carcasses, the floor, or fixed objects.
- While skinning the head, the head skinner should sterilize his knife as frequently as necessary to prevent cuts from cross-contaminating.
- Remove heads as soon as possible after skinning to further reduce contamination exposure.
- Prevent contamination with rumen contents during head removal. This can usually be accomplished by tying the esophagus and then pulling the head sharply to the side as the gullet is cut. Removal of rumen content contamination is difficult because of its finely textured character, which makes prevention even more important.
- Remove the horns, all pieces of hide, and eardrums from each head prior to washing.
- Clean the equipment used for holding heads for trimming and dehorning between each head. Disinfect after use on each suspect, retained, or other obviously diseased animal.
- Prevent cross-contamination of other heads or adjacent carcasses and to limit airborne contaminants.
- Thoroughly flush the oral and both nasal cavities before washing the outer surfaces of each head.
- Head hooks in washing cabinets should be removable to allow for cleaning and sterilizing or sanitizing. Clean hooks between each use and sterilize hooks after handling suspect, retained, or obviously diseased heads. If the head hooks are not removable, the equipment should be designed for in-place sterilization and equipped with an integral thermometer or other temperature-measuring device.
- Have procedures in place to make sure heavily contaminated heads do not cross contaminate other heads in head wash cabinets (e.g., shut off the cabinet before heavily contaminated heads enter the cabinet and recondition or discard affected product after inspection)
- Clean and sterilize head inspection racks after each use involving a retained head. Since this is impractical to accomplish with hooks installed on a continuous chain, provide all such installations with a suitable wash cabinet or other device that will clean and sterilize each hook prior to its subsequent use.

Best Practices during Head Removal continued

- The minimum temperature for hot water sterilization is 180°F. Use an integral thermometer or other temperature-measuring device for continuous monitoring to ensure a minimum temperature of 180°F is met for hot water sterilization. Maintain proper employee hygiene practices to prevent carcass contamination and the creation of insanitary conditions. Do not touch the carcass with soiled hands, tools, or garments.
- Address specified risk materials in accordance with 9 CFR 310.22.
- Apply a validated decontamination or antimicrobial treatment at this point in the process that is effective in reducing the presence or counts of microbial contaminants.

What are best practices during brisket opening?

This is the point in the process where the brisket is split (i.e., cut along the centerline) to facilitate the easy removal of the thoracic viscera. The thoracic cavity is entered blindly and there is no way of knowing if abscesses or other pathological conditions are present. Therefore, the saw, or other instrument used to split the brisket, should be disinfected after each use, making sure to remove remnant tissue from the saw.

Best Practices during Brisket Opening

- Clean and sanitize the brisket saw and knife between each carcass and ensure the gastrointestinal tract is not punctured.
- Maintain proper employee hygiene practices to prevent carcass contamination and the creation of insanitary conditions. Do not touch the carcass with soiled hands, tools, or garments.
- Apply a validated decontamination or antimicrobial treatment at this point in the process that is effective in reducing the presence or counts of microbial contaminants.

What are best practices during evisceration?

This is the point in the process where the removal of the viscera (e.g., the edible offal that includes the heart, intestines, paunch, liver, spleen, and kidneys when presented with viscera) occurs. The actual removal of the viscera from the carcass is a critical phase of the dressing operation. Care should be taken to avoid cutting or breaking the paunch and intestines because the gastrointestinal tract can contain pathogens. If the viscera are not handled properly, or if employee hygiene practices are not being followed, contamination of the carcass and edible offal can occur.

Best Practices during Evisceration Continued

- The boot cleaning compartment should be conveniently located and constructed so as to prevent splash of contaminants onto carcasses or viscera. Thoroughly clean and disinfect contaminated footwear, apron, or knife.
- Thoroughly clean and disinfect the viscera inspection truck, especially if it becomes soiled with visceral contents (e.g., feces, ingesta) or contaminated with purulent material or viscera from a condemned carcass. To prevent fat buildup on the metal pluck pan or paunch and viscera portion of the inspection truck, periodically clean with hot water. Prevent cross contaminating product or equipment when rinsing a viscera inspection truck.
- Maintain proper employee hygiene practices to prevent carcass contamination and the creation of insanitary conditions. Do not touch the carcass with soiled hands, tools, or garments.
- Address specified risk materials in accordance with 9 CFR 310.22.
- Apply a validated post-evisceration decontamination or antimicrobial treatment that is effective in reducing the presence or counts of microbial contaminants.

What are the best practices during head and cheek processing?

This is the point in the process where the meat is removed from the head and cheek. This meat can be is used in the production of raw beef products, including ground beef. It is important for the establishment to maintain sanitary conditions.

Best Practices during Head and Cheek Processing

- Properly maintain and clean knives.
- Provide adequate separation or use compartments or shields to prevent cross contamination of heads.
- Maintain proper employee hygiene practices to prevent carcass contamination and the creation of insanitary conditions. Do not touch heads with soiled hands, tools, or garments.
- Address specified risk materials in accordance with 9 CFR 310.22.
- Quickly chill head and cheek meat to limit pathogen multiplication
- Apply any validated decontamination or antimicrobial intervention treatments after lymph node incision that are effective in reducing the presence or counts of microbial contaminants.
- Alternatively, send head and cheek meat for cooking or other full-lethality treatment (e.g., high pressure processing or irradiation).
- Conduct microbiological testing (e.g., STEC) for process control to assess the effectiveness of the establishment's sanitary dressing procedures and any antimicrobial intervention treatments that are applied to the head and cheek meat as these products may undergo different interventions than the carcass.

What are best practices during carcass splitting?

This is the point in the process where carcasses are split vertically into two halves. Prior to splitting, the establishment should remove all contamination, bruises, grubs, and tissue damaged by grubs from the midline area of the back. This is necessary to prevent spreading these contaminants to bone and other surfaces by the saw.

Best Practices during Carcass Splitting

- Remove organic material, bruises, grubs, and tissue damaged by grubs from the midline area of the back prior to splitting.
- Sanitize saws and knives between each carcass. Disinfect the splitting saw after each use on suspect, retained, or obviously diseased carcasses.
- Allow adequate separation between carcasses to limit carcass-to-carcass contact.
- Maintain proper employee hygiene practices to prevent carcass contamination and the creation of insanitary conditions. Do not touch the carcass with soiled hands, tools, or garments.
- Address specified risk materials in accordance with 9 CFR 310.22.
- When splitting is done at the half-hoist position, take measures to prevent the neck and foreshanks from contacting the floor. If necessary, install a sanitizable surface so the neck and foreshanks do not contact the floor.
- Apply any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants.

What are the best practices during Chilling

This is the point in the process where the temperature of the carcass and parts is reduced. Temperature control and sanitation measures ensure the microbial load reductions affected by the interventions are maintained. Temperature control limits pathogen multiplication and sanitary measures prevent re-contamination.

Best Practices during Chilling

- Begin carcass chilling within one hour of bleed-out to limit pathogen multiplication.
- Begin variety meats chilling within one hour after removal from carcass to limit pathogen multiplication.
- Implement temperature control and sanitation procedures to maintain the microbial reductions achieved by the antimicrobial intervention treatments.
- Define and monitor refrigeration parameters so that carcasses reach a temperature of 40°F (4.4°C) or less within 24 hours and so that this temperature is maintained on all products. Take and record carcass temperature from 5 randomly spaced locations, usually 1 mm under fascia on the inside round.
- Maintain finished product storage areas 40 °F or lower.
- Provide adequate distance between carcasses, walls, and equipment to prevent cross contamination and allow for efficient air circulation to prevent or minimize condensation.
- Ventilate coolers with negative-pressure systems to prevent cross contamination from airflow from slaughter operations.
- Do not hold aged beef longer than 7 days. During the 7 days or less, maintain temperatures at 40 °F or lower.
- Transport carcasses for hot boning (deboned before chilling) to the boning areas directly from the slaughter department. Do not delay boning. Maintain the boning room environmental temperature at 50 °F (10 °C) or lower.
- Apply any validated decontamination or antimicrobial intervention treatments at this point in the process to reduce microbiological contamination.
- Maintain proper employee hygiene practices to prevent the creation of insanitary conditions (e.g., touching the carcass with soiled hands, tools, or garments).
- Prevent cross contamination from airflow from slaughter operations.
- Establish traffic patterns to eliminate movement of personnel, pallets, and refuse containers between slaughter and further processing. If they must work in both areas, have procedures in place so employees change outer and other soiled clothing, wash and sanitize hands, and clean and sanitize footwear.

KEY QUESTION
Carcass Wash Cabinets

Question: How do establishments use carcass wash cabinets appropriately?

Answer: Develop measures to prevent spreading contamination to adjacent carcasses. These measures include:

- Removing all visible contamination before carcasses enter the cabinet.
- Preventing overspray of water from the cabinet onto adjacent carcasses.
- Preventing carcasses with conditions such as open abscesses, septic bruises, or the presence of parasites and parasitic lesions from entering the cabinet.
- Wash from the top of the carcass in a downward direction so that contaminants gravitate away from the clean areas.
- Having procedures in place to make sure heavily contaminated carcasses do not cross contaminate other carcasses (e.g., shut off the cabinet before heavily contaminated carcasses enter the cabinet and recondition or discard affected product after inspection).
- Conducting on-going verification to ensure that any re-circulated hot water used in the cabinet meets 9 CFR 416.2 (g)(3). This regulation states that, "Water, ice, and solutions used to chill or wash raw product may be reused for the same purpose provided that measures are taken to reduce physical, chemical, and microbiological contamination so as to prevent contamination or adulteration of product. Reuse that has come into contact with raw product may not be used on ready-to-eat product."
- Having procedures in place to prevent carcasses identified with U.S. Suspect or Retained tags from entering the cabinets or having procedures in place to prevent cross-contamination of adjacent carcasses (e.g., shut off the cabinet before U.S. Suspect or Retained carcasses enter the cabinet and recondition or discard affected product). **NOTE**: Establishments can wash U.S. Suspects in these cabinets only with permission of the Public Health Veterinarian (PHV), and in consideration of whether the design of the cabinet prevents cross-contamination of other carcasses.
- Address potential hazards associated with water reuse in non-food processing areas prevent the creation of insanitary conditions.

What are best practices during carcass fabrication?

This is the point in the process where the carcass is broken down into primal and subprimal cuts and trimmings. Temperature control limits pathogen multiplication and sanitary measures prevent re-contamination.

Best Practices during Carcass Fabrication

- Implement temperature control and sanitation procedures to maintain the microbial reductions achieved by the antimicrobial intervention treatments.
- Maintain processing room temperature at 50°F (10°C) or lower.
- Provide for efficient air circulation to prevent or minimize condensation.
- Ventilate coolers with negative-pressure systems to prevent cross contamination from airflow from slaughter operations.
- Maintain proper employee hygiene practices to prevent the creation of insanitary conditions. Do not touch the carcass with soiled hands, tools, or garments.
- Clean and sanitize knives, saws, slicers, and other food contact surfaces as frequently as necessary to prevent the creation of insanitary conditions.
- Establish traffic patterns to eliminate movement of personnel, pallets, and refuse containers between slaughter and further processing. If they must work in both areas, have procedures in place so employees change outer and other soiled clothing, wash and sanitize hands, and clean and sanitize footwear before moving from slaughter to further processing areas.
- Remove large carcass lymph nodes (subiliac, popliteal and superficial cervical) as described in the Agricultural Marketing Service's (AMS) Institutional Meat Purchase Specifications Fresh Beef Series that are in place so that participating establishments have a greater likelihood to meet AMS's zero tolerance standard for *Salmonella* and consider removing additional carcass lymph nodes (axillary, coxalis, and iliofemoralis) as shown in the figures that follow because lymph nodes are known to contain *Salmonella*.

  References:
  - Haneklaus, A. N., K. B. Harris, D. B. Griffin, T. S. Edrington, L. M. Lucia, and J. W. Savell. 2012. *Salmonella* Prevalence in Bovine Lymph Nodes Differs among Feedyards. *J. Food Prot.* 75:1131-1133.
  - Brown, T. R., T. S. Edgrington, G. H. Loneragan, D. L. Hanson, K. Malin, J. J. Ison, and D. J. Nisbet. 2015. Investigation into Possible Differences in *Salmonella* Prevalence in the Peripheral Lymph Nodes of Cattle Derived from Distinct Production Systems and of Different Breed Types. *J. Food Prot*. 78:2081-2084.
  - Arthur, T. M., D. M. Brichta-Harhay, J. M. Bosilevac, M. N. Guerini, N. Kalchayanand, J. E. Wells, S. D. Shackelford, T. L. Wheeler, and M. Koohmaraie. 2008. Prevalence and Characterization of *Salmonella* in Bovine Lymph Nodes Potentially Destined for Use in Ground Beef. *J. Food Prot.* 71:1685-1688.
- Employ any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants.
- Conduct microbiological testing (e.g., STEC) of trim in its HACCP Plan, Sanitation SOP, Good Manufacturing Practices (GMP), or other prerequisite programs to verify process control.

Lymph Node Removal

Only lymph nodes that are intimate to the muscle and incidental to the process should be included in meat products. Lymph nodes are a meat byproduct (a meat byproduct is any edible part other than meat). The standards of identity for "Chopped Beef", "Ground Beef", "Hamburger" and "Beef Patties" are contained in 9 CFR 319.15 (a), (b) and (c). These standards do not allow for the inclusion of meat byproducts in products labeled as Chopped Beef, Ground Beef, Hamburger and Beef patties. There is an exception involving beef patties. Beef Patties can contain beef byproducts if the byproducts are included in the ingredients statement. Therefore, outside of Beef Patties meeting this exception, the inclusion of lymphatic tissue other than that which is incidental (i.e. small lymph nodes that are not readily accessible and intimately associated with the muscle tissue) to the process are not permitted in meat products.

FSIS has consistently provided the above guidance to industry through askFSIS and other means. However, continued questions received through askFSIS have shown the need to provide additional clarification of definition of "incidental." Furthermore, recent research articles have identified major peripheral lymph nodes as a potential source of pathogenic bacteria. Slaughter and dressing processes and/or typical interventions used to reduce pathogens on carcasses are not effective at reducing the pathogens that may be contained in the lymph nodes.

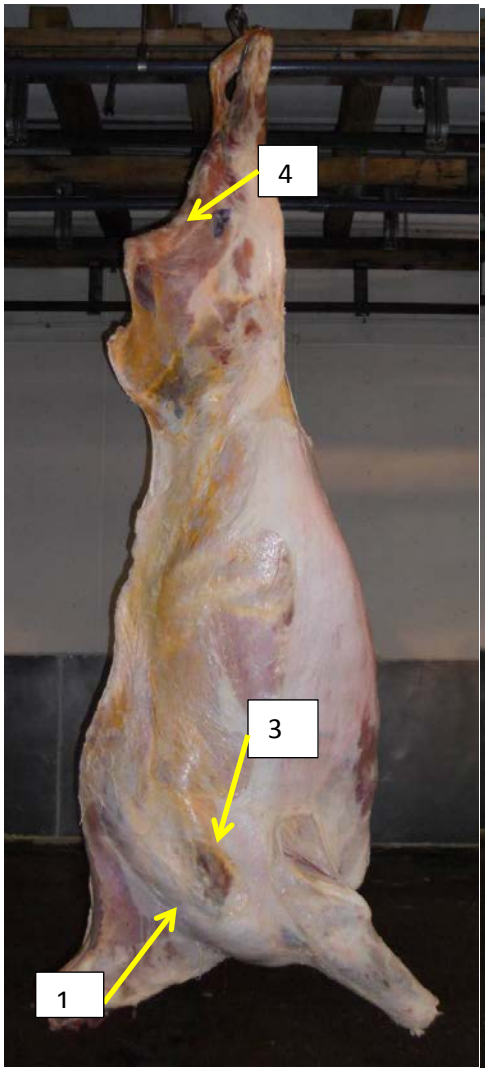
FSIS considers the following six (6) peripheral lymph nodes as "major" lymph nodes that should be removed prior to producing all meat products including, but not limited to: "Chopped Beef," "Ground Beef," "Hamburger" and "Beef Patties": superficial cervical, subiliac, axillary, popliteal, coxalis, and iliofemoralis. In addition, the lymph nodes of the head and tongue incised during inspection procedures (Medial and Lateral Retropharyngeal, Parotid and Mandibular lymph nodes) are easily identified and would not be incidental to beef products.

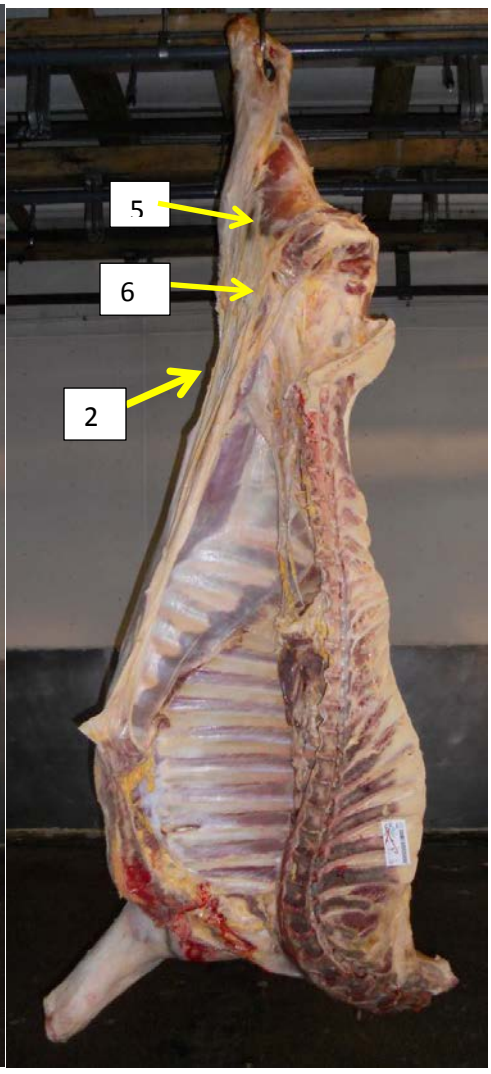
Due to regulatory requirements and food safety implications, major peripheral lymph nodes of the carcass, as well as lymph nodes of the head and tongue would not be incidental to the process. These lymph nodes should be removed prior to further processing of the meat into beef products including "Chopped Beef," "Ground Beef," "Hamburger" or "Beef Patties".

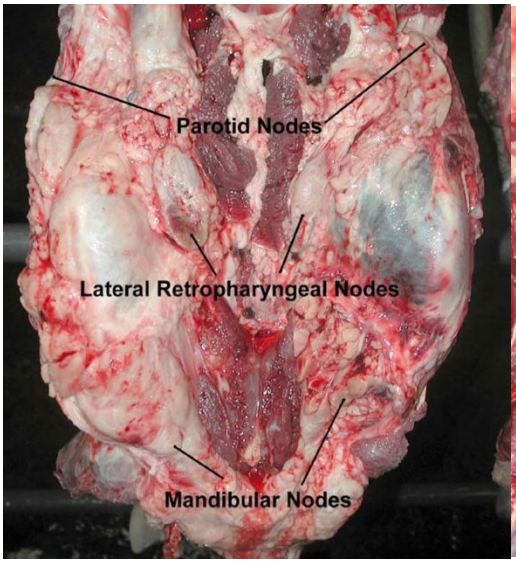
Slaughter and Processing establishments should develop lymph node removal procedures and incorporate them into their food safety system to ensure the beef products produced do not contain lymphatic tissue that is not incidental to the process. A description of the size and location of the six major peripheral lymph nodes is included below to assist slaughter and processing establishments in identifying and removing these lymph nodes.

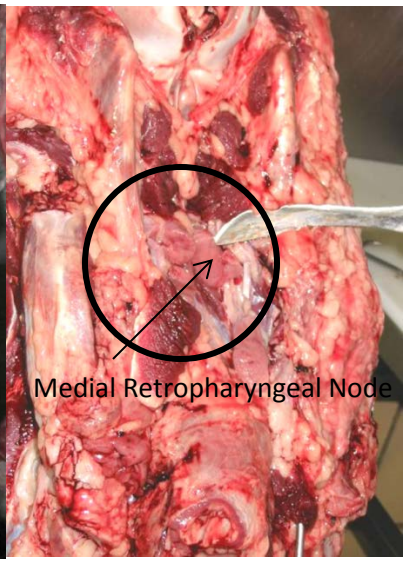
Establishments that receive beef products from other establishments should receive documentation (such as a Letter of Guarantee (LOG)) from their supplier to support that their supplier has procedures in place to ensure the removal of all lymph nodes that are not incidental to the process.

The carcass pictures below show the general location of these 6 lymph nodes. 1) superficial cervical; 2) subiliac; 3) axillary; 4) popliteal; 5) coxalis; and 6) Iliofemoralis of the head.





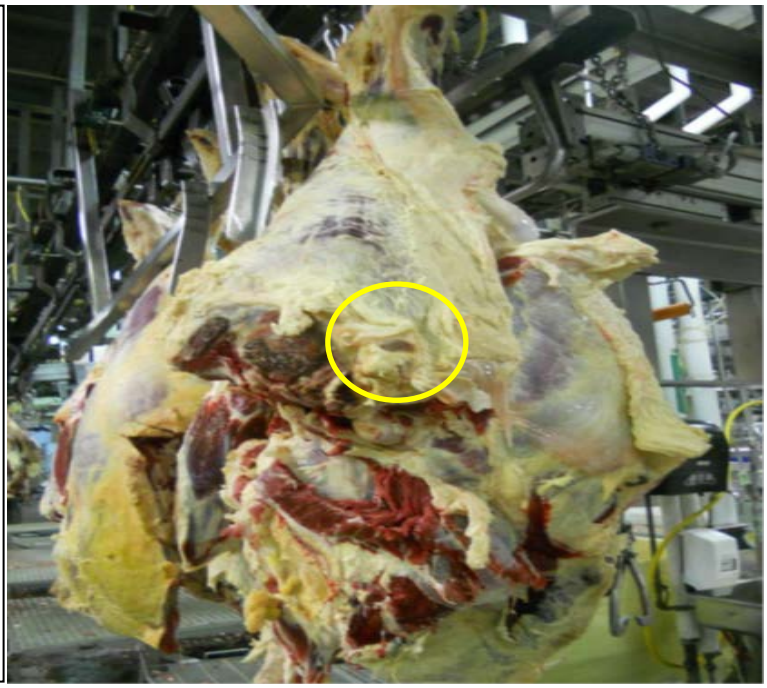




1. The **superficial cervical LN** is in the chuck in front of the point of the shoulder, anterior to the mock tender/blade bone underneath a couple of superficial muscles. It is closer to the larger end of the mock tender in the middle of the wedge or fish fat pocket. It is elongated and can be 0.5 to 4 inches in length and 0.5 to 0.75 inches wide.

2. The **subiliac LN** is also known as the prefemoral. It is located about 8 to 10 inches below the patella (hanging carcass), between the surface flank muscle and the bottom edge of the knuckle muscles. It is in contact with or close to the tri-tip, in the fat between the tri-tip and the bottom sirloin butt. It is elongated, usually flattened and can be 3 to 4 inches long and .75 to 1 inch wide.

3. The **Axillary LN** is in the chuck at the bottom of the teres major in the fat of the shoulder clod. It is on the distal portion of the teres major and should be exposed by removal of the shoulder clod. It is usually 2 to 4 inches caudal to the shoulder joint.



4. The **popliteal LN** is in the round, in the fat between the bottom round and the eye of round. It can be 1 to 1.5 inches long and 0.75 to 1 inch wide.

5. **Coxalis LN** is between the tri-tip and the loin tail towards the upper end of the tri-tip, in the heel meat.

6. **Iliofemoralis LN** is in the subcutaneous fat associated with and towards the rear of the bottom sirloin flap.

What are best practices during packaging, product storage, and transport?

These are the points in the process products are packaged, stored, and transported for further distribution. Temperature control limits pathogen multiplication and sanitary measures prevent re-contamination.

Best Practices during Packaging, Product Storage, and Transport

- Implement temperature control and sanitation procedures to maintain the microbiological reductions achieved by the antimicrobial intervention treatments applied during the slaughter process.
- Maintain storage room and transportation vehicles at 40°F (4.4°C) or lower.
- Maintain the average internal meat temperature during storage at 40°F (4.4°C) or lower.
- Monitor and record environmental and product temperature during storage and transport.
- Provide for efficient air circulation to prevent or minimize condensation.
- Prevent contamination from airflow, traffic, people, and other environmental sources.
- Maintain proper employee hygiene practices to prevent the creation of insanitary conditions. Do not touch the product with soiled hands, tools, or garments.

How do antimicrobial treatments fit into the HACCP regulatory framework?

Establishments implement antimicrobial interventions as needed to reduce STEC and *Salmonella*. The HACCP regulations require establishments to provide scientific support for their interventions and to implement their interventions according to their support.

9 CFR 417.2(a) requires that an establishment identify any food safety hazards that might occur in the production process, assess which hazards are reasonably likely to occur, and develop measures to prevent, eliminate, or reduce to an acceptable level those hazards. The establishment must maintain documents supporting the decisions that it makes during the hazard analysis (9 CFR 417.5(a)(1)).

Establishments may incorporate the use of interventions in their HACCP plan, sanitation SOP, or other prerequisite program. Establishments may incorporate the use of interventions in their HACCP plan and apply the intervention as a Critical Control Point to control hazards that are reasonably likely to occur (9 CFR 417.2(c)(3)). Alternatively, an establishment may determine that a hazard is not reasonably likely to occur because the establishment maintains preventive measures as part of a prerequisite program that prevents the hazard from occurring. In either case, the establishment should identify the critical operating parameters in its supporting documentation. HACCP plans ***control*** hazards; prerequisite programs (including SSOP) ***prevent*** hazards from entering the establishment's food safety system.

What are critical operating parameters and how do they fit into the establishment's HACCP system?

As described in the FSIS Compliance Guideline HACCP Systems Validation, critical operating parameters are the specific conditions, (e.g., time, concentration, temperature, full product or carcass coverage) that the intervention must operate under in order for it to be effective. The establishment should then incorporate the critical operating parameters into its critical limits if the establishment applies the intervention as part of a CCP. Alternatively, the establishment should incorporate the critical operating parameters into its procedures if the establishment implements its intervention as part of a sanitation SOP or other prerequisite program.

Why is it important for establishments to incorporate antimicrobial interventions into their HACCP systems?

Despite good slaughter practices, contamination of carcasses can occur. Thus, the use of effective antimicrobial intervention strategies is an important component of an integrated food safety system. FSIS recommends that establishments implement antimicrobial interventions throughout the slaughter and fabrication process following points in the process where carcasses are most vulnerable to contamination, e.g., during hide removal and post-evisceration as part of a multi-hurdle approach. Further, FSIS recommends that establishments identify the typical microbial loads introduced into their slaughter process and develop a multi-hurdle approach that is designed to reduce microbial hazards to acceptable levels. FSIS also recommends that establishments take into account the higher prevalence season (April-October) and make any needed adjustments to their food safety system.

How do establishments identify critical operating parameters?

As explained in the FSIS Compliance Guideline HACCP Systems Validation , establishments should identify supporting documentation that closely matches their interventions and should identify, implement and monitor the critical operating parameters from the scientific supporting documentation relevant to their interventions. Critical operating parameters are the specific conditions that an intervention must operate under in order for it to be effective. These critical operating parameters should be incorporated into the HACCP system (including prerequisite programs). They may or may not be incorporated into the critical limit for a CCP. If an establishment uses a scientific study as its supporting documentation, the critical operating parameters from the scientific study should match the intervention implemented by the establishment as closely as possible. Establishments have flexibility in how they verify that they are implementing the critical operating parameters for applying antimicrobial interventions. In some circumstances establishments may be able to support using critical operating parameters that are different from those in the support documents (e.g., different concentrations of antimicrobial agents or temperature of the antimicrobial).

Key Point

Establishments should identify supporting documentation that closely matches their interventions, identify the critical operating parameters that are necessary for the intervention to be effective, and implement their interventions so that they meet these critical parameters.

In cases where critical operating parameters are different from the supporting documentation, establishments should provide justification to support that the levels chosen are at least as effective as those in the supporting documentation. This justification is needed because different levels of a critical operating parameter may not always be equally effective. For example, antimicrobial agents may only be effective within a range of concentration after which point efficacy may decrease. In addition to ensuring that the levels

chosen are at least equally as effective, establishments should ensure the levels are also safe and suitable.

FSIS Directive 7120.1 Safe and Suitable Ingredients used in the Production of Meat, Poultry, and Egg Products is updated monthly and includes a list of antimicrobial agents that are safe and suitable for certain products under certain conditions.

What are some examples of critical operating parameters for applying antimicrobial or hot water interventions on carcasses and fabricated raw beef products?

- Product coverage
- Contact time
- Temperature
- Equipment
- pH
- Dwell time
- Pressure
- Concentration

Key Point

With any antimicrobial intervention, carcass/product coverage is important.

There are simple verification procedures an establishment can use to ensure its antimicrobial intervention achieves carcass/product coverage. For example, the establishment could apply the intervention using fluorescein instead of the antimicrobial to evaluate carcass/product coverage. Alternatively, the establishment could apply paper towels or an edible spray cream before the intervention and evaluate the carcass/product for full coverage after the intervention. FSIS developed guidance to assist establishments in complying with initial validation requirements.

What are some examples of antimicrobial interventions?

Antimicrobial intervention methods are designed to reduce microbial contamination on the carcasses and parts, and usually involve the application of organic acids, hot water, steam, physical means or a combination in sequence. The integration of established intervention methods, such as knife trimming, in combination with other antimicrobial decontamination methods such as steam vacuuming, acid or hot water spray washing systems, and steam pasteurization can help to improve the microbial safety of beef carcasses immediately post-slaughter. Establishments should apply these interventions according to their scientific support. The table below shows the antimicrobial interventions used during the beef slaughter process.

Intervention Type	Intervention Description
Hide-on carcass washes	Hide-on carcass washes are an effective means to significantly reduce bacterial populations on the hide, a significant source of contamination in slaughter operations. Hide-on carcass washes commonly used include hypobromous acid; sodium hydroxide and a proprietary surfactant with a sodium hypochlorite rinse, and water washes with chlorine use.
Steam vacuum systems	The hot water sprayed onto a carcass kills bacteria and detaches contamination such as ingesta or feces, which is then vacuumed off. Many establishments utilize the steam vacuum system at multiple points in the slaughter process. For example, there may be a steam vacuum location after each part of the carcass is skinned.
Pre-evisceration wash and final carcass organic acid wash	The pre-evisceration wash consists of the use of a carcass spray immediately after hide removal and serves to remove bacteria before they have the opportunity to attach themselves to the carcass surface and begin growing. The final carcass organic acid rinse provides a significant kill step for any bacteria that remain on the carcass surface at the end of the slaughter process. This intervention is commonly applied after the slaughter process is complete and before the carcasses enter the cooler. The organic acids commonly used are acetic and lactic, although citric acid is also approved for this purpose. The concentration of the organic acid is normally between 1.5% and 2.5% and can be as high as 5% in the case of lactic acid. Hypobromous acid is another effective acid that is commonly used in the industry. Organic acids may be applied as a mist, fog, or a small droplet rinse. Studies have shown that washing followed by an organic acid rinse is significantly more effective in reducing bacterial numbers than washing alone.
Pre-evisceration and final carcass hot water washes	High temperature water sprayed on the carcass (Hot Water Rinse) as a pre-evisceration wash and at post-evisceration prior to chilling has been shown to be effective in substantially reducing the numbers of STEC and *Salmonella*.
Steam pasteurization	Steam pasteurization is a process in which the carcasses are placed in a slightly pressurized, closed chamber at room temperature and sprayed with steam that blankets and condenses over the entire carcass, raising the surface temperature (generally to 185º F) and killing up to 95-99% of all bacteria. Carcasses are then sprayed with cold water.

Why is it important for establishments to conduct verification testing?

FSIS requires that establishments perform ongoing verification activities to ensure that their food safety system is functioning as intended (9 CFR 417.4(a)(2)) and support decisions made in their hazard analysis (9 CFR 417.2 and 417.5(a)(1)). FSIS recommends that establishments incorporate statistical process control procedures into their testing programs to assess the effectiveness of their controls for preventing contamination during the slaughter operation and verify that they are reducing pathogen levels, including STEC to below detectable levels. Establishments can use the microbial results to support decisions made in their HACCP systems and demonstrate that their food safety system is functioning as intended. Establishment sampling programs can be supplemented with other types of verification activities associated with production of other raw ground beef and patty components.

Beef Slaughter Processing Deficiencies

What issues has FSIS identified concerning slaughter establishments?

FSIS conducted a review of food safety assessments (FSAs) and onsite visits to slaughter establishments with a history of multiple positive STEC results from FSIS testing.

During the review, FSIS identified the following common deficiencies:

- inadequate sanitary dressing,
- ineffective antimicrobial intervention implementation, and
- failure to use microbial data in decision-making.

What are some examples of sanitary dressing deficiencies FSIS observed repeatedly at beef slaughter establishments?

FSIS identified that establishments commonly failed to do the following:

- Implement a comprehensive sanitary dressing program that included written procedures designed to prevent contamination from occurring throughout the process, adequate employee training concerning the procedures, and management commitment to the program.
- Verify that the dressing procedures were performed as written and were effective and consistently performed.
- Properly design their facilities and equipment to prevent carcasses from contacting each other or non-food contact surfaces, prevent overspray of antimicrobial treatments or aerosolization of particulate matter, and allow adequate visualization of dressing procedures (e.g., through proper lighting or access).
- Perform robust sampling according to their supporting documentation to provide them reliable results to inform their slaughter operation.
- Adequately respond to FSIS or establishment test results with effective and sustained corrective actions that identify the cause, eliminate it, and prevent recurrence.
- Apply antimicrobial interventions according to their supporting documentation.

Examples of Sanitary Dressing Deficiencies

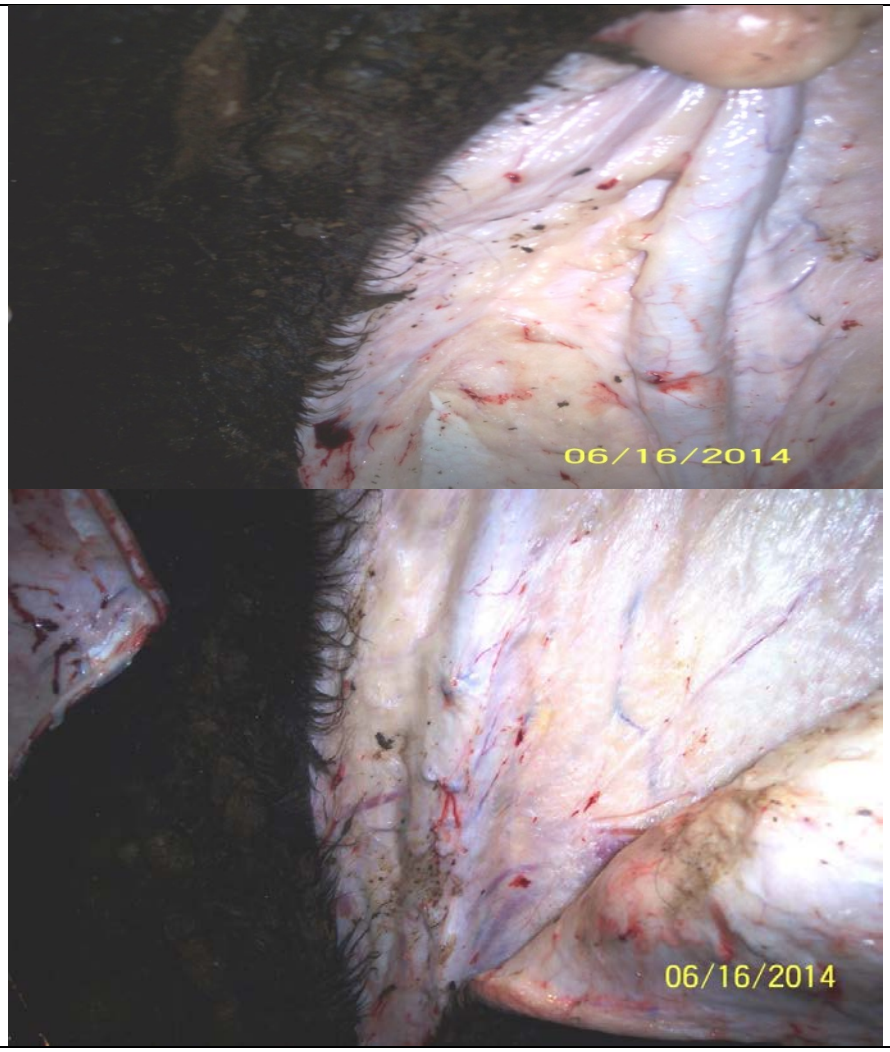
Cutting through the weasand (esophagus) during sticking, resulting in ingesta contaminating the carcass and head.

In this photo, the establishment uses a large cut to bleed the calf and ingesta is leaking from the esophagus during bleeding (yellow arrow). FSIS also observed employees removing the head without closing the weasand.

Cutting through the hide and into the carcass without sanitizing knives, gloves, and equipment, resulting in carcass contamination.

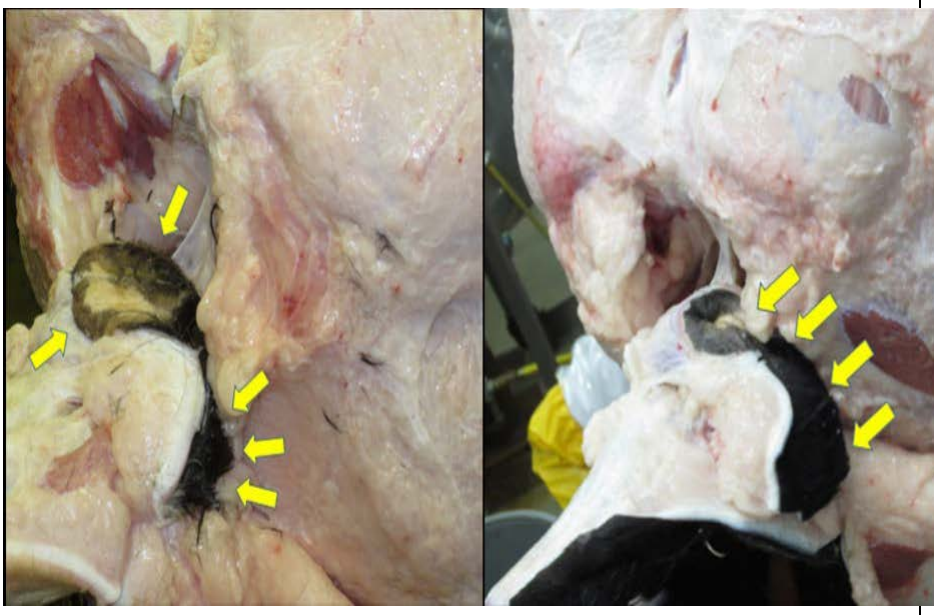
Note how grossly contaminated the hide is, further increasing the risk of contamination. Proper hide removal is a critical step in preventing carcass contamination and the creation of insanitary conditions.

Inadequately sanitizing knives, gloves, and equipment resulting in Carcass contamination along Pattern Lines during Hide Removal (part 1 of 2)	

Inadequately sanitizing knives, gloves, and equipment resulting in carcass contamination along pattern lines during Hide Removal (part 2 of 2) .	

Contaminated carcass as a result of contact with non-food contact surfaces. (circled in yellow).	
Carcass contamination from the Hide Flaps during Hide Removal This photo shows hide flaps that have curled under after hide removal and are contaminating the carcass.	

Splatter contamination resulting from improperly adjusted hide pullers. Improperly adjusted hide pullers can cause carcass contamination.	 

Bagged bung contacting hide resulting in carcass contamination. This photo shows the bagged bung contacting the hide (yellow arrow) while the employee is tying the bagged bung. Bunging performed before the hide of the rump is removed results in contamination of the carcass. This occurs because the bagged bung will likely contact the hide and later contaminate the carcass as the gastrointestinal tract is removed during evisceration and the bagged bung is pulled through pelvic inlet.	
Failing to bag and tie the bung. The contaminated bung is contacting the exposed carcass (yellow arrows). When establishments apply hot water or antimicrobial interventions to an exposed bung, they may further spread contamination.	

Contamination during Evisceration

Punctured paunch and intestines during evisceration causing carcass contamination with ingesta (second photo).

What are some examples of antimicrobial intervention deficiencies FSIS observed repeatedly at beef slaughter establishments?

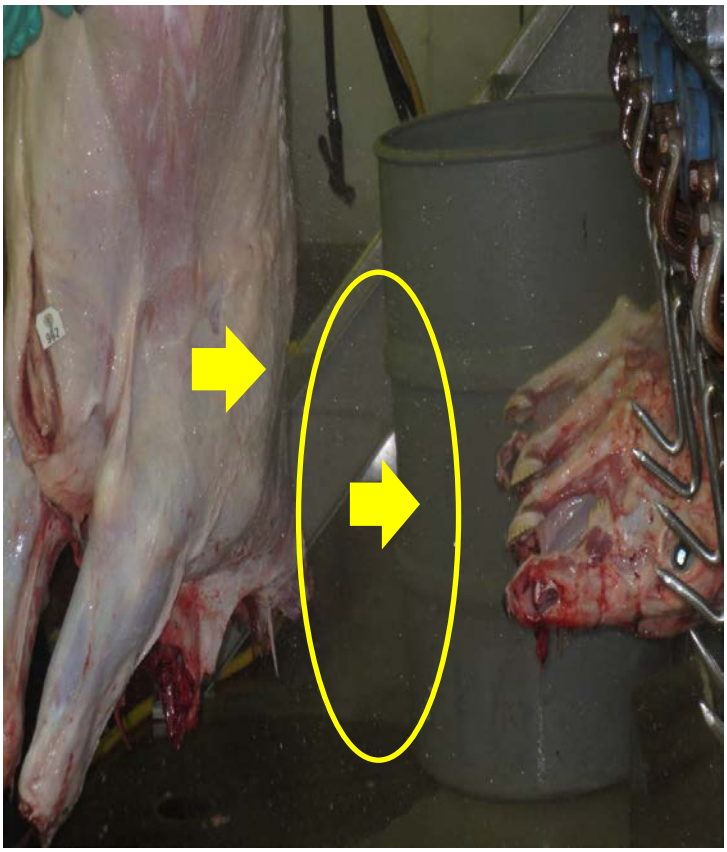
FSIS identified that establishments commonly failed to do the following:

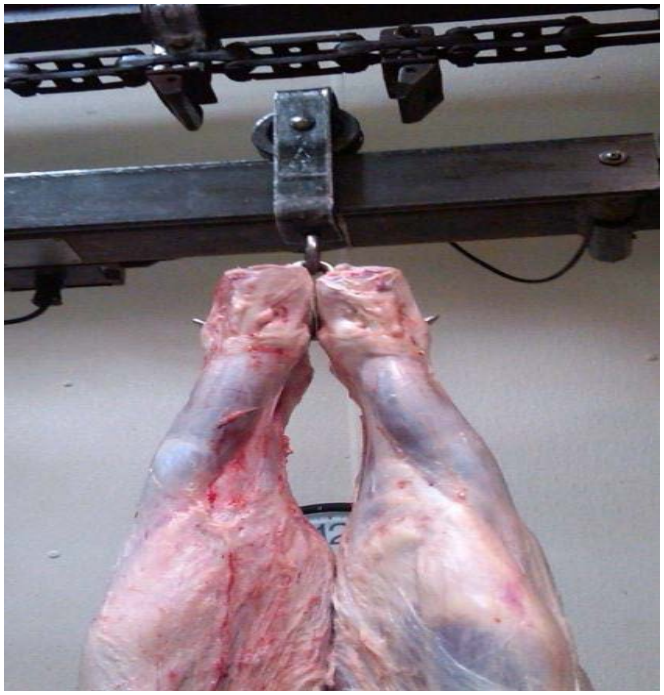
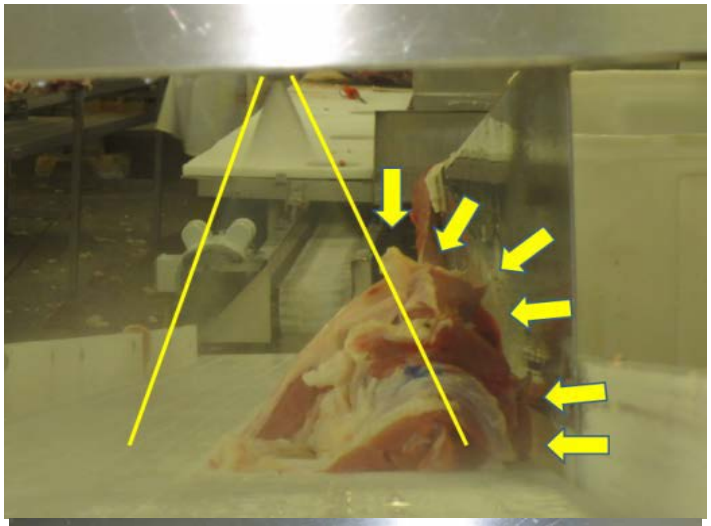
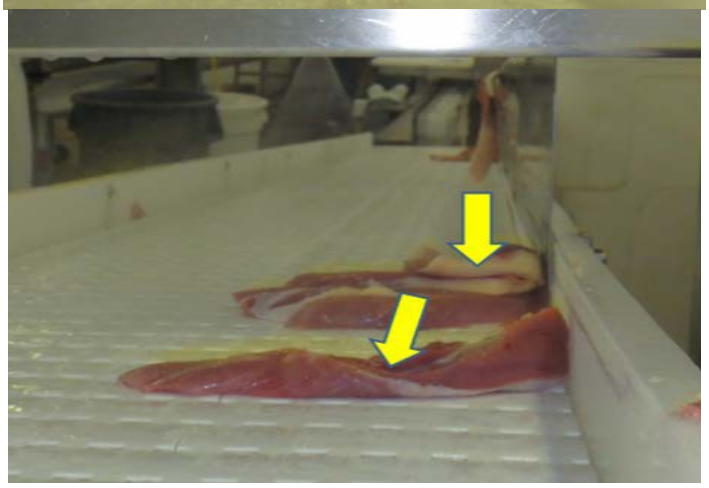
- apply antimicrobial interventions according to their supporting documentation;
- identify critical operational parameters in their supporting documentation;
- incorporate the parameters into their HACCP system; and
- implement the antimicrobial treatments so that critical operational parameters were met.

Examples of antimicrobial intervention implementation Deficiencies

Cross-contamination during antimicrobial intervention treatment

- **Cross-contamination of heads from carcass intervention overspray.** (Water sprayed onto carcass in the direction of the arrows, water spray seen within the yellow oval)
- Cross contamination (not shown in image) when employees spray equipment, the floor, and other surfaces and establishments not taking appropriate precautions to prevent overspray from contacting carcasses.
- Carcasses with visible contamination entering a wash cabinet or when manual application of water or antimicrobial sprays occurs on visibly contaminated carcass it will result in cross contamination.



Intervention failing to achieve full carcass coverage, thus reducing the intervention's effectiveness. This photo shows the practice of suspending a carcass from a single hook, which prevents antimicrobial and hot water interventions from achieving carcass/product coverage. Ensuring that the entire carcass surface is treated, is necessary for the intervention to operate effectively and as intended.	
Intervention failing to achieve full product coverage, thus reducing the intervention's effectiveness. Product coverage is essential for the intervention to be effective. The top photo shows that the arc of the spray nozzles (inside each yellow line) is not sufficient to reach product on the sides of the conveyor belt (yellow arrows). Both pictures show that the spray intervention is being applied only to the one side of the trim. These pictures also show product that is folded on top of itself so that the intervention is not applied to all product surfaces (the top photo shows the trim is piled up and the bottom photo shows that each piece has a single fold).	 

What are some FSIS findings of establishments failing to properly use microbial data in decision-making?

Some establishments that had multiple STEC positives samples from FSIS testing failed to properly assess the impact the test results had on their slaughter operations. Test results reflect the effectiveness of the establishment's slaughter operation, including the effectiveness of its sanitary dressing procedures and antimicrobial treatments. In response to the test results, establishments failed to take meaningful corrective actions designed to identify and eliminate the cause for the positive results and prevent recurrence. The scope of the corrective actions was limited to ensuring that lots contaminated with STEC received appropriate disposition. Corrective actions were not aimed to improve the design and implementation of slaughter operations.

Additionally, some establishments did not conduct robust sampling, which could have provided them meaningful information concerning the effectiveness of their slaughter operation. In some situations, establishments had designed rigorous sampling programs but were not implementing them effectively. Specifically, establishments were not properly collecting N60 samples. Sample slices were smaller in size than the N60 method requires. Additionally, external surfaces were not targeted for N60 sampling, and, in some cases, the tissues were thicker, which reduces the sensitivity of the method. Establishments that conduct robust sampling properly have ongoing information concerning the effectiveness of their slaughter operation and can respond to the microbial data to improve their operations.

Useful guidance documents developed by industry concerning best practices during beef slaughter and microbiological sampling
Best Practices for Beef Harvest (http://www.bifsco.org/CMDocs/BIFSCO2/New%20Best%20Practices/Best_Practice_Slaughter_Sept2009.pdf) This document discusses food safety best practices for use throughout the slaughter operation. The use of best practices along with current science and technology allows slaughter operators to produce visibly clean carcasses and reduce the incidence level of pathogenic contamination.
Best Practices for Spinal Cord Removal (http://www.bifsco.org/CMDocs/BIFSCO2/Best%20Practices/spinal_cord_removal2002.pdf) This document provides Good Manufacturing Practices (GMPs) to improve process control for assuring the removal of spinal cord from vertebral bone.
Industry Best Practices for Holding Tested Products (http://www.bifsco.org/CMDocs/BIFSCO2/New%20Best%20Practices/Holding_Tested_Products_Sept2005.pdf) This document describes effective practices to help establishments develop and implement the optimal system for testing and holding products to be used when conducting the testing and when government agencies take a sample.
Best Practices for Using Microbiological Sampling (http://www.bifsco.org/CMDocs/BIFSCO2/New%20Best%20Practices/Microbiological_Sampling_BP_March2008.pdf) This document provides best practices applicable throughout the industry to help establishments develop appropriate procedures for using microbiological testing to verify process control.
Antimicrobial Interventions Reference Document (http://www.bifsco.org/CMDocs/BIFSCO2/Best%20Practices%20New/Antimicrobial%20Interventions%20for%20Beef.pdf) This document, funded by the beef checkoff, describes the multiple actions taken by the industry to reduce the potential for carcass contamination including scientifically proven antimicrobial interventions that can be applied individually or in combination with other treatment to reduce pathogens on the carcass surfaces.
Sampling, Lotting and Sample Analysis Guidance (http://www.bifsco.org/CMDocs/BIFSCO2/New%20Best%20Practices/Sampling_Lotting_and_Sample_Analysis_Document_FINAL_OCT_2010_Posted-2.pdf) This document provides best industry practices for components (lotting, sampling and laboratory analysis) of the pathogen-testing program as a part of an overall food safety system. The effectiveness of these practices depends on the proper implementation of the best practices leading to these steps and after these steps

Appendices

This section includes Appendix 1, *Establishment Self-Assessment Checklist for Sanitary Dressing Procedures*. Additionally, establishments can use Appendix 1 to develop written sanitary dressing procedures designed to prevent contamination throughout the slaughter process. Establishments can use the information in Appendix 1 to design verification activities to ensure that their employees are performing the procedures according to the written procedures on an on-going basis. This section also includes Appendix 2, *Carcass Sanitary Dressing Audit*. Establishments can use Appendix 2 to verify, in real-time using carcass audits, that their sanitary dressing procedures are effectively preventing contamination throughout the slaughter process.

Appendix 1, *Establishment Self-Assessment Checklist for Sanitary Dressing Procedures*. Live Receiving/Holding			
Questions	**Yes**	**No**	**Comment**
Do we take measures such as periodic cleaning of the unloading areas and pens to reduce the contamination of animals during unloading and holding?			
Do we apply a bacteriophage to cattle?			
Do we conduct cattle washing?			
Do we have data showing that washing decreases incoming bacterial loads?			
Do we monitor the cattle washing process to ensure that contamination is minimized?			
Do we use water mist as a means to reduce airborne dust and dirt particles in the holding area?			
Do we use a “mud-scoring” system in order to identify cattle that may present an increased likelihood of contamination during hide removal?			
Do we react to cattle showing increased loads of contamination on the hides?			
Do we determine the incoming bacterial load on animals?			
Do we consider differences in the age or type of cattle we receive (e.g. veal calves, sale barn cattle, feedlot cattle, hide condition) and does that represent a concern related to pathogen load that we address?			

Sticking			
Questions	**Yes**	**No**	**Comment**
Do we use the smallest cut possible to accomplish the bleeding?			
Do we use a two-knife system for sticking and clean the hand between sticking each carcass?			
Do we sanitize knives between animals?			
Do we employ any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants?			

Hide removal			
Questions	**Yes**	**No**	**Comment**
Do we use a validated hide-on carcass wash?			
Do we use a two-knife system for the entire de-hiding process?			
Do we remove the udder in a manner to prevent contamination of the carcass with milk, as well as to prevent contamination of the exposed carcass by the hide, or by a soiled knife or employee hand?			
Do we remove visible contamination from the pattern (cut line)?			
Do we trim or steam vacuum pattern lines?			
Do we prevent wicking of moisture into hide openings?			
Are carcasses or parts of carcasses touching or banging into each other?			
Are there excessive turns or switchbacks in the de-hiding line such that hide-on cattle are passing by carcasses with the hide partially removed?			
Do we have shields between the carcasses and hide puller to minimize potential contamination?			
Do we remove the tail switch when using the hide puller to minimize the possibility that contaminants can become airborne from splattering or flapping the hide?			
Is the hide puller causing carcass contamination or cross contamination of adjacent carcasses?			

If we use a cradle, are live animals in such close proximity to the partially dressed animal on the cradle that airborne contamination is a concern?			
If we use mechanical hide pullers, do they pull away from the carcass (e.g., downward or backward and not upward), thereby reducing the potential for contamination from drip splatter?			
When the hide is pulled from the carcass, does it splatter the dressed carcass or adjacent carcasses?			
If employees are handling carcasses during hide pulling, does the hide cross-contaminate the carcass or employees' equipment and clothing? If so, is the contamination removed from employee's equipment and clothing before continuing dressing procedures?			
Does the exterior side of the hide touch, slap, or flap the carcass as it is removed from or another when being removed, potentially allowing the contaminated exterior to touch the carcass?			
Do we maintain clean mechanical hide puller contact points with the hide, hands, and garments of the employees handling the hide and carcass, and knives and other equipment contacting the de-hided carcass?			
Do our employees maintain proper employee hygiene practices to prevent the creation of insanitary condition (e.g., touching the carcass with soiled hands, tools, or garments)?			
In the process of reflecting the hide from the carcass, do our employees intentionally or accidentally cut through the hide? Do we clean and sanitize knives, air knives, or other equipment and clothing before proceeding to reflect the hide away from the carcass any further?			
Do we allow for adequate distance between carcasses throughout the slaughter dress process to minimize carcass-to-carcass contact and cross contamination?			
Do we allow adequate separation of carcasses, parts, and viscera during dressing? This would include at switchbacks (sharp turns) and areas where carcasses in the hide-on area pass in close proximity to carcasses in the hide-off area.			
Are the hides (especially of feet, legs, tails) of carcasses in the hide-on area cross contaminating equipment and clothing of the employees (aprons, scabbards, steels, gloves)? If so, do we clean and sanitize contaminated equipment or clothing?			
Do we apply a carcass wash cabinet at this point, or any point in the slaughter process? If so, do we ensure that cabinets do not spread contamination to adjacent carcasses?			
Do we control overspray from the cabinet?			
Do we address conditions such as open abscesses, septic bruises, or the presence of parasites and parasitic lesions before carcasses enter the cabinet?			

Do we address pooling of water around the anus of the carcass prior to dropping the bung?			
Do we ensure that carcasses with excessive contamination do not cross contaminate other carcasses (i.e., create an insanitary condition)?			
Do we ensure that carcasses identified with U.S. Suspect or Retained tags, and which are to be removed from the slaughter line at a further point in the process, do not enter the cabinets unless measures are in place to prevent cross contamination of equipment or other carcasses? *U.S. Suspects are to be washed in these cabinets only with permission of the PHV, and in consideration of whether the design of the cabinet prevents cross contamination of other carcasses.			
Do we employ any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants?			

Bunging

Questions	Yes	No	Comment
Do we put plastic bags and ties on the bung in a sanitary manner?			
Do we maintain proper employee hygiene practices to prevent the creation of insanitary conditions (e.g., touching the carcass with soiled hands, tools, or garments)?			
Do we employ any validated decontamination or antimicrobial intervention treatment that is effective in reducing presence or counts of microbial contaminants at this point in the process?			

Brisket opening

Questions	Yes	No	Comment
Do we clean and sanitize the brisket saw and knife between each carcass, and ensure that we do not puncture the gastrointestinal tract?			
Do we maintain proper employee hygiene practices to prevent the creation of insanitary conditions (e.g., touching the carcass with soiled hands, tools, or garments)?			
Do we employ any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants?			

Head Removal			
Questions	**Yes**	**No**	**Comment**
Do we remove heads in a manner that avoids contamination with digestive tract contents or specified risk materials (SRM)?			
Do we adequately wash heads, including thoroughly flushing the nasal cavities and mouth before washing the outside surfaces?			
Do we limit the splashing of water when washing heads in order to prevent cross contamination and to limit airborne contaminants?			
Do we properly maintain and clean knives?			
Do we maintain proper employee hygiene practices to prevent the creation of insanitary conditions (e.g., touching the carcass with soiled hands, tools, or garments)?			
If we use a head wash cabinet at this point in the slaughter process, do we ensure that excessively contaminated heads do not enter the cabinet, that the equipment holding the head does not contaminate the head, and that spray from the cabinet does not spread contamination to adjacent heads?			
Do we employ any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants?			

Rodding the Weasand (esophagus)			
Questions	**Yes**	**No**	**Comment**
Do we close the esophagus to prevent leakage of rumen contents?			
Do we maintain proper employee hygiene practices (e.g., wash hands and arms often enough to prevent contamination of the carcass)?			
Do we change or sanitize the weasand rod between each carcass?			
Do we properly maintain and clean knives?			
Do we clean and chill the weasand quickly to limit contamination and pathogen multiplication?			
Do we employ any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants?			
Evisceration			
Questions	**Yes**	**No**	**Comment**
Do we remove visible contamination from the area to be cut (e.g., by trimming or by using air knives or by steam vacuuming) before the cut is made?			
Do we remove the uterus in a manner that prevents contamination of the carcass and viscera?			
Do we properly use knives to prevent damage (i.e., puncturing) to the paunch and intestines?			
Do we remove contamination in a timely manner and in accordance with accepted reconditioning procedures?			
Do our employees on moving evisceration lines using footbaths and separate footwear to prevent footwear from contaminating other parts of the operation?			
Do we employ any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants?			

Carcass splitting

Questions	Yes	No	Comment
Do clean and sanitize the saws and knives between each carcass?			
Do we allow for adequate distance between carcasses (i.e., limit carcass-to-carcass contact)?			
Do we employ any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants?			
Do we address the removal of spinal cords in accordance with 9 CFR 310.22?			

Head and cheek meat processing

Questions	Yes	No	Comment
Do we properly maintain and clean knives?			
Do we prevent cross contamination of heads?			
Do we maintain proper employee hygiene practices to prevent the creation of insanitary conditions (e.g. touching the head with soiled hands, tools, or garments)?			
Do we quickly chill head and cheek meat to limit pathogen multiplication?			
Do we employ any validated decontamination or antimicrobial intervention treatments at this point in the process that are effective in reducing the presence or counts of microbial contaminants?			

Appendix 2. Carcass Sanitary Dressing Audit

DATE:	**CARCASS MONITORING (THREE TIMES PER PRODUCTION PERIOD)** Effective Prevention of Contamination at Slaughter Steps
TIME:	**AUDIT LOCATION:** ❑ **AFTER LEGGING** ❑ **AFTER HIDE PULLER** ❑ **PRIOR TO PRE-EVIS** ❑ **POST EVIS** ❑ **PRIOR TO OTHER WASHES** ❑ **ZERO TOLERANCE** ❑ **COOLER**

CARCASS #	CONTAMINATION OBSERVED	CONTAMINATION TYPE **F** fecal **I** ingesta **H** hair **O** other (e.g. milk, abscess) **GHM** grease/hook marks **RF** rail fallout	CONTAMINATION LOCATION **H** hock **RD** round **RP** rump **SR** sirloin **SL** short loin **R** rib **C** chuck **FS** foreshank **B** brisket **SP** short plate **F** flank **N** neck	DEGREE OF CONTAMINATION **MILD** mild **MOD** moderate **SEV** severe
1.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV
2.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV
3.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV
4.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV
5.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV
6.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV
7.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV
8.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV
9.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV
10.	❑ YES ❑ NO	❑ F ❑ I ❑ H ❑ O ❑ GHM ❑ RF	❑ H ❑ RD ❑ RP ❑ SR ❑ R ❑ C ❑ FS ❑ B ❑ SP ❑ F ❑ N	❑ MILD ❑ MOD ❑ SEV

CARCASS #	CORRECTIVE ACTION?	CORRECTIVE ACTION	**§417.4 (A)(2)(II) MONITORING DIRECT OBSERVATION**	
1.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK	VERIFICATION ARE THE PROCEDURES FOR THIS SLAUGHTER STEP EFFECTIVELY PREVENTING CONTAMINATION? IF NOT, STATE WHY IN THE COMMENTS SECTION BELOW. ❑ YES ❑ NO VER. INIT. _____	
2.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK		
3.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK		
4.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK		
5.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK		
6.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK		
7.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK		
8.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK		
9.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK		
10.	❑ YES ❑ NO	❑ TRIMMED ❑ RAILED REWORK		

COMMENTS:

CORRECTIVE ACTIONS TAKEN:

FURTHER ACTION(S) RECOMMENDED:

How to use Appendix 2, *Carcass Sanitary Dressing Audit*

Audit location: Where in the slaughter process this audit is performed check one box).

Carcass #: Indicate identifying number of each carcass in the audit.

Contamination observed: Indicate 'yes' or 'no' by checking the correct box.

Contamination type: Indicate the type of contamination by checking the box by the correct letter.

F = Fecal contamination I = Ingesta H = Hair
GHM = Grease/hook marks, also oil RF = Rail fallout or rail dust
O = other (such as milk, abscess or any other form of contamination)

Contamination location: Indicate the location of contamination on the carcass by checking the box by the correct letter (see diagram for reference)

H = hock	RD = round	RP = rump
SR = sirloin	SL = short loin	R = rib
C = chuck	FS = foreshank	B = brisket
SP = short plate	F = flank	N = neck

Degree of contamination: Indicate how much contamination is found on the carcass by checking the correct box. Multiple mild or moderate contaminations or one or two severe contaminations indicate a significant loss of process control. Each establishment should develop process control criteria for each slaughter step and identify criteria for when the process is out of control. Establishments should use those criteria to determine the effectiveness of its slaughter dressing procedures. The following are examples only. Establishments will want to develop their own criteria by slaughter step and identify criteria for when they determine their process is out of control.

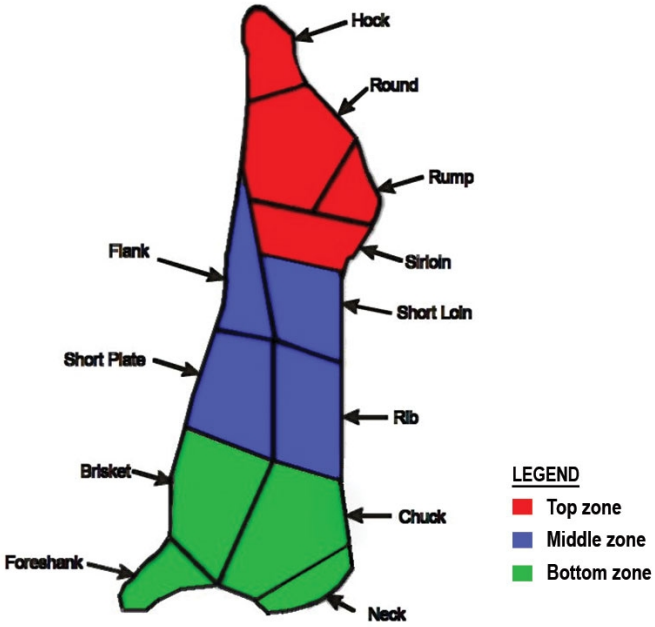
- MILD = mild. Contamination is limited to a small area in one location on the carcass. For example, a cluster of 3-4 hairs, a speck of fecal contamination, or a few small pieces of rail fallout in a small area.
- MOD = moderate. Contamination is over one medium sized area, or is small, but in 3-4 locations on the carcass. For example, multiple clusters of 3-4 hairs over the carcass or one larger cluster of hair.
- SEV = severe. Contamination is spread over multiple locations on the carcass, or in one large location. For example, a large streak of fecal contamination, such as may occur from a hide slap.

Corrective action: Indicate 'yes' or 'no' by checking the correct box.

Corrective action taken: Indicate whether the carcass was trimmed or railed out and reworked.

Verification: Indicate whether the procedures in this location effectively prevent contamination by checking 'yes' or 'no' and initial. Establishments should use their process control criteria for determining whether the sanitary dressing procedures at this step effectively prevented contamination.

Comments: Indicate further comments, corrective actions (including preventative measures) and recommended actions in the space available.


Hock
Round
Rump
Flank
Sirloin
Short Loin
Short Plate
Rib
Brisket
Chuck
Foreshank
Neck
LEGEND
Top zone
Middle zone
Bottom zone

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